SIND, PUNJAB, N. W. PROVINCES.

TABLES

OF

HEIGHTS

IN SIND, THE PUNJAB,

N. W. PROVINCES, AND CENTRAL INDIA,

DETERMINED BY THE

GREAT TRIGONOMETRICAL SURVEY OF INDIA,

TRIGONOMETRICALLY

AND BY

SPIRIT LEVELING OPERATIONS,

TO MAY 1862.

CALCUTTA:
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PREFACE.

In the autumn of 1861, a Special Commission was appointed to investigate the circumstances connected with the recent severe visitations of cholera, in various Military Stations in the Punjab and North-Western Provinces of British India.

The Commissioners represented that it was frequently found very difficult to form a correct opinion as to the merits of existing or proposed works for drainage or water supply, on account of the absence of complete and systematic sets of levels for each Station. They recommended the construction of permanent bench-marks in every Cantonment, and further suggested that the levels of all the principal Stations should be connected together, and referred to one constant datum. Ultimately the Survey Department was called on to take steps to collect and reduce all the data of levels existing in the Public Works, Railway, and Survey Offices, all over India.

As a first step towards this desirable measure, the following Tables of heights deduced by the Trigonometrical Survey of India are published. They originate from, and are all referred to, the mean sea level of Karachi Harbor.

An undertaking of such vast extent as the connexion of levels all over India, and their reduction to a common datum, cannot be achieved without the cordial co-operation of the Officers of the Public Works and Railway Departments. The present Tables are published in order that these Officers may have the means of reducing their levels to the sea, by connecting them with the nearest Station of the Trigonometrical Survey. They will then be in a position to supply the

Survey Department with Tables of levels, referred to the sea as a common datum, to be published as supplements to this work.

It is hoped that eventually, after the different lines of levels have been connected and reduced to the sea, Charts of levels may be prepared, to show at a glance the water-shed and water-courses, and all the most important particulars connected with the contour of the country, and thus embody the information which has hitherto been acquired, or may in future be obtained, rendering it generally available to the public, in the form in which it will probably be most readily appreciated.

For reasons which will be explained in the description of the determination of heights by the Trigonometrical Survey of India, the Tables now published are restricted to the provinces west of the meridian of Dehra Doon, Agra, and Gwalior, and north of the parallel of Karachi. Additional Tables for other districts will be published from time to time, as soon as available.

J. T. WALKER, *Major*, R. E.,

Supt., Great Trigonometrical Survey.

OFFICE OF G. T. SURVEY;
IN THE FIELD,
1*st January*, 1863.

ERRATA AND ADDENDA.

Page 35. *Add*—The values of height are expressed in feet, of the standard unit of measure of the G. T. Survey of India.

" 36. " The Latitudes of the Stations of the Great Arc (Sections X, XI, and XII) differ from the values given in Colonel Everest's Account of the measurement of the Indian Arc (1847), in being unreduced for the discrepancy between the Terrestrial and Astronomical Arcs of Amplitude, described at page CLXX of the Introduction.

" 41, *line* 6 *from bottom.* *For* evidently, *read* originally.

" 61, " 7 " *top.* " Jellalabad, " Jacobabad.

" 64, " 3 " " " north-north east, *read* south-south-west.

" 113,	Longitude	East end Dehra Dhoon Base.	*For* 78° 1′ 1″,	*read* 78° 0′ 58″
" 117,	"	Begarazpur, T. S.	" 77° 44′ 32″,	" 77° 44′ 29″
" 121,	"	Boolundshuhr, T. S.	" 77° 54′ 15″,	" 77° 54′ 13″
" 128,	"	Dholepoor, H. S.	" 77° 52′ 2″,	" 77° 52′ 0″
" 132,	"	Surental, H. S.	" 77° 43′ 14″,	" 77° 43′ 11″
" 132,	"	S. W. End Sironj Base Line.	" 77° 47′ 56″,	" 77° 47′ 53″
" 134,	"	" " "	" 77° 47′ 43″,	" 77° 47′ 53″

" 156, *line* 8 *from bottom.* *For* Paujpir *read* Panjpir.

CONTENTS.

DESCRIPTION OF THE METHODS OF DETERMINING HEIGHTS, WHICH ARE PRACTISED IN THE GREAT TRIGONOMETRICAL SURVEY OF INDIA.

I.—The Method of Vertical Angles.

From the origin of the Trigonometrical Survey, until so recently as the year 1856, all heights were invariably determined by the method of reciprocal vertical angles, between the principal Stations of the Triangulation.

2. In a hilly or mountainous region, this method is susceptible of a high degree of accuracy, which, when the angles are measured with a powerful Micrometer Theodolite, probably exceeds what could be expected from the best Spirit Leveling operations, over ground of this nature. But in the plains, it is beset with many difficulties. The rays of light passing from the object to the observer, traverse a thick murky atmosphere, which is subject to many changes, being sometimes dense and heavy with dust and moisture, at other times rarified by the heat which is radiated at mid-day from the surface of the ground. The amount by which the rays are refracted is therefore very variable and uncertain.

3. A station in the plains, viewed from another ten or twelve miles off, will appear at a minimum height between the hours of 1 and 3 P. M.; it will then rise, at first gradually, but afterwards very rapidly, as the sun sinks, and the dews fall, and will obtain its maximum elevation during the night, at the time when the lower strata of the atmosphere are most saturated with moisture. As the sun rises, the phenomena are repeated in the reverse order, and the object sinks, rapidly at first, but more slowly as the time of minimum approaches. The height through which it will have thus appeared to rise and fall, in twenty-four hours, has been found, in the plains of the Punjab, to be usually from 100 to 150 feet, varying with the amount of moisture in the atmosphere, the nature of the soil, the heat of the sun's rays, and, more particularly, with the distance at which the rays from the object pass above the ground level. A few feet of difference in the height of a station, has a considerable effect on those phenomena. In some experimental observations

which were taken to a pair of signals, one of which was 16½ feet above the other, at a distance of 10¾ miles, at which they truly subtended 60 seconds, their apparent subtenses were as follows :—

	Hrs.	Min.				
At	2	33	P. M.	...	...	74 seconds.
"	2	43	"	...	...	70 "
"	4	16	"	...	...	58 "
"	4	33	"	...	...	49 "
"	4	43	"	...	...	42 "

showing that when the day was hottest, the negative refraction in the lower ray, passing through rarified strata, combined with the positive refraction in the upper, to exaggerate the apparent distance of the signals; while towards sunset, the excess of positive refraction in the lower ray, now passing through the most dense strata, over that in the upper, produced the opposite effect, and diminished the apparent distance of the signals.

4. The method of reciprocal verticals is based on the supposition that the back and forward angles are equally refracted, and that the refraction is consequently eliminated, in deducing the angle subtended by the excess of the higher station over the lower. But the anomalies, and irregularities of the trajectories of light, in the lower strata of the atmosphere, as already instanced, render it highly improbable that the refraction can be equal, in the back and forward observations. In general there is only one large instrument with a survey party, so that the forward angles are measured one day, and the back angles some days afterwards; in the interval, the weather may have changed, and with it the refraction, which therefore can no longer be wholly eliminated. There is also much reason to doubt whether, on the same day, and at the same moment, the amount of refraction is identical, at two mutually visible stations. There are instances on record, of observers sent to take simultaneous reciprocal verticals, finding one station to be visible from the other half an hour before the visibility was mutual, so that the observations at the first station might have been completed, before it began to be seen from the second.

5. The series of triangles of the Trigonometrical Survey of India are probably the longest in the world. Some are more than 2,000 miles from sea to sea, without external check or verification. Thus, it became

necessary to check their determinations of height, by Spirit Levels. Even in the Ordnance Survey of Great Britain, the heights are mostly based on Spirit Leveling operations, though there the facilities for verification by reference to the sea are peculiarly numerous, as no point of the United Kingdom is more than 90 miles distant from the Sea Coast.

6. In 1858 the Indian Survey commenced a series of Spirit Levels, which has now connected Attok, Dehra Dhoon, and Sironj (in Central India) with the mean sea level of Karachi harbor, and has checked the heights of numerous stations, previously determined trigonometrically. The comparative results of the two methods of operation have been far more satisfactory than was expected, and it is found that, notwithstanding the anomalies and difficulties of refraction, the errors introduced have a tendency, in practise, to cancel each other, and the results are consistent and accurate, *provided the vertical observations were taken during the period of minimum refraction, which occurs daily between the hours of* 1 *and* 3 P. M., *apparent time.* For upwards of twenty-five years, it has been a rule, in this survey, to restrict the vertical observations between principal stations to the period of minimum, and to measure the back angle at nearly the same interval from apparent noon as the forward angle.

7. Thus the heights of the Trigonometrical Survey may be divided into two classes, those determined before, and those after, the discovery of the period of minimum refraction. Previously, it was the custom to take vertical observations indiscriminately, at any time of the day, and sometimes even during the night, and then error was liable to enter to a considerable extent. In some long series of triangles there are errors of 70 to 115 feet. The old heights of the survey will therefore not be made use of, in the general connexion and reduction of levels. But the later results have been found to agree very closely with those obtained from the Spirit Leveling operations, and may be safely employed as a basis of connection.

8. The following comparisons will suffice to establish the accuracy of the results of the recent Trigonometrical observations. From the sea at Karachi to Attok Base line, 706 miles,

The rise, trigonometrically is	1014·9 feet.
" by leveling	1018·1 "
Difference ...	3·2 feet.

From Attok Base, to Dehra Dhoon Base, 416 miles,

The rise, trigonometrically is	944·6	feet.
" by leveling...	939·5	"
Difference ...	5·1	feet.

From Dehra Dhoon Base, to Sironj Base in India, 429 miles,

The fall, trigonometrically is	428·1	feet.
" by leveling	426·3	"
Difference ...	1·8	feet.

While from Sironj Base to Sea at Karachi, 669 miles,

The fall, trigonometrically is	1533·4	feet.
" by leveling...	1531·3	"
Difference ...	2·1	feet.

The leveling operations from Karachi to Attok passed through the Indus Series of triangles, and verified the heights of 42 principal stations. The two sets of operations were brought up entirely independently of each other; their maximum divergence is 8·7 feet, which occurs at a station near the middle of the line. The average error of the 42 Trigonometrical stations is 3·08 feet. Such close coincidence is the more remarkable, because for a distance of upwards of 450 miles, the triangulation passes through the valley of the Indus, over a dead level plain, which is rarely relieved by a mound or undulation, and for the most part, is covered with damp jungles of tamarisk, and low grass, which are peculiarly effective in disturbing the atmosphere above them, and causing anomalous refraction.

The vertical angles were therefore measured under more than ordinarily disadvantageous circumstances, and thus their errors are probably greater than the average error of the ordinary vertical triangulation.

II. The Spirit Leveling Operations.

9. A series of levels, to be extended over a distance of many hundred miles, without external check or verification, was felt to be a formidable undertaking, requiring the utmost care and forethought, to guard it from the errors to which such operations are liable.

10. The most probable source of error being in reading the leveling staves, the precaution was taken of making up staves specially figured, so as to check the readings. They were painted and divided on both faces to feet, tenths, and hundredths, one face having a white ground with black divisions, numbered from 0 to 10, the other having a black ground, with white divisions, numbered from 5·55 to 15·55. When such a staff is set up, the readings of the black and white faces, as they are presented in succession to the observer, should differ by the constant quantity 5·55. If the telescope wire intersects the commencement of a foot on one face, it will intersect the middle of an entirely different foot on the other, and consequently the observer cannot be biassed to repeat, in the second reading, a mistake which he may have made in the first. Any error, in either reading, is immediately shown up by the deviation of their difference from its normal amount 5·55, or in practise by the difference in the resulting rise, or fall, obtained from the pairs of black and white face readings, which ought to give coincident results.

11. The staves were supplied with plummets, let into their sides, and visible through glass doors. Swivels were fixed on the tops of the staves, for guy ropes, to adjust them to the perpendicular, and keep them steady. In order that the results obtained at each station, by the successive observers, might be rigorously compared, it was necessary that the successive staves should invariably be set up on constant points, and never on uneven surfaces. This was secured by driving a hemispherical brass brad into the head of each of the pins that were used for marking out the line of levels; the brad not only served as a point of reference, but enabled the staves to be revolved freely, as each face was presented in succession to the observer.

12. The instruments employed were standard levels by Messrs. Troughton and Simms, of 21 inches focal length, and powers averaging 42. They were originally constructed for the Punjab Canal Department, at the request of Colonel, now General, Sir Robert Napier, K. C. B., when Chief Engineer in the Punjab. They were altogether very satisfactory, and superior to ordinary leveling instruments. Their levels were fitted with finely graduated scales, for reading the positions of the ends of the bubble, which was invariably done, and the readings were recorded in the field book, after the manner of observations with Astronomical Instruments. When the run of the level is known, a subtense Table,

showing the correction to the level of a station for different degrees of dislevelment, at different distances, is easily prepared. It need not occupy more than a page of foolscap, and can be readily used in the field. By this method, there is no necessity to level the instrument with perfect accuracy at each station, before making a staff reading; thus the time saved in manipulation counterbalances the delay caused by reading and recording the bubble indications, and applying corrections, which is unquestionably the only rigorous and satisfactory process, where minute accuracy is required.

13. The staves were invariably set up at equal distances from the instrument, in order to cancel errors of adjustment. Throughout the whole of the operations, which have now extended over nearly 2,000 miles, including much hilly and broken ground, the rule of equal distances has not been transgressed in a single instance, though the instruments must have been set up at upwards of 12,000 stations.

14. Operations were commenced in November 1858, in Upper Sind, by three observers, working in succession over the same line, each with his own instrument and pair of staves. The brass brads on the heads of the pins marking out the line, ensured the resting of the successive staves on the same point, but for which a satisfactory comparison could not have been instituted at each station, between the results of the different observers.

III.—The Errors to which Spirit Leveling Operations are liable.

15. Leveling operations, in conjunction with Canals and Railways, are now of very frequent occurrence. There are few Engineers who have not leveled long distances, and cannot boast of extensive circuits, closing with little or no apparent error, and therefore presumed to be errorless. A like good fortune was anticipated for these operations, which were executed with more than ordinary refinement and precision. But it was soon found that, though the results obtained at each station, by the different observers, invariably agreed very closely, the differences had a tendency to lie all in one way, and thus cause a remarkably continuous divergence, between the lines traced by the different observers. This was at one time so great as to create considerable anxiety and apprehension. In investigating its cause, some interesting facts were noticed, which will presently be described.

16. But first it may be mentioned that similar cumulative differences had occurred in a level line, measured during the year 1837-38, from the British Channel to the English Channel, under the direction of Professor Whewell, by Mr. Bunt, Civil Engineer, for the British Association. In his report thereon the Professor remarks—"It may here be observed, "that the most important precaution, that of making the distances of "the staff from the telescope equal in the fore observation and the back "observation, was throughout attended to; and that all the lines were "leveled in both directions, proceeding from the beginning to the end of "the line, and then returning back from the end to the beginning.

"By employing this method of verification, an apparent error in "the process is brought into view, for which it is difficult to account, "but which is so constant in its occurrence that we cannot help suppos-"ing it to depend on some general cause. The error consists in this; "that in proceeding with the leveling operation along a line which is "really level, the further end constantly appears, from the observation, "to be the lower end, and the amount of this depression appears to "increase with the distance. Hence, when we go to the end of a line "and then return to the starting point, we find the resulting elevation "of the point lower than its real elevation. The difference arising from "this cause is never considerable, but is always in the same direction, "and generally (in the same series of operations) greater in proportion "as the distance is greater. Thus in the line from Bristol to Portis-"head (11 miles) it was 1·07 inches; from Bridgewater to Axmouth "(40 miles) it was 4·11 inches; from Bridgewater to East Quantockshead "(16 miles) it was 1·94 inches; from Bridgewater to Portishead (29 miles) "it was 7·6 inches."

17. Similarly Mr. Bunt reports—"The total length of my line of "leveling between Portishead and Axmouth, besides the branch lines to "Bristol and East Quantockshead, is about 74 miles. This distance was "divided into separate stages; each of which, averaging about 10 miles "in length, was twice leveled over, first in one direction, and then in the "opposite, before the next stage was commenced. It is very remarkable, "that with few partial exceptions, the heights of all the points touched "upon by both series, came out less by the levels returning, than by the "levels going: so that the first station, or starting point, always ap-"peared lower when I returned, than it was at my setting out. But

" as the height of this point is the same in both cases, the error must, " of course, be thrown on the distant point, or station at which the " returning levels commenced, which reverses the first apparent dif- " ferences, and makes all the heights in the second series progressively " greater than those in the first, the most distant point having the " greatest error. The following Table gives the differences thus found " at 20 points along the line between Portishead and Axmouth, the " height, in every instance, coming out greater from the series of levels " returning towards Portishead" :—

"No. of Station in "Minute Book.	Miles from Portishead.	Height greater by 2nd" than 1st Levels." Feet.
1683	0	0·0000
1631	3	0·0633
1593	6	0·1557
1562	9	0·2703
1527	12	0·3501
1278	15	0·3796
1229	18	0·4591
1178	23	0·5339
1128	27	0·5734
759	30	0·6352
1	33	0·6888
45	37	0·6956
63	39	0·7170
114	43	0·7532
177	49	0·8237
210	52	0·8622
246	56	0·9021
248	59	0·9208
402	63	0·9373
462	68	0·9714
656	74	1·0294

From the above results Professor Whewell and Mr. Bunt came to the natural conclusion "that no leveling can be expected to give a cor- " rect result unless it be performed in opposite directions, and the mean " of both results be taken."

18. These interesting operations were unfortunately unknown to the Survey Officers when they commenced their's. Surveyors in this country labor under the disadvantage of having not only to purchase, but also to carry about, whatever books of reference they may require. The small Libraries of our Officers could not boast a single volume of the Reports of the British Association. It was not until nearly the close of the first seasons's operations on the Indus, that a copy of Professor Whewell's Report was obtained, or we should have been spared much anxiety and troublesome investigation.

19. Two years previously, a single series of levels had been carried in circuits round the sides of some triangles on the meridian of 73°, starting from the side Nar to Kadar (12·85 miles long) which was made the base of the future levels, and was therefore leveled twice, the second time in an opposite direction to the first, with a closing error of ·19 inch. The circuit errors of the triangles were not at first examined. The results obtained on each side were originally treated as if they had been determined trigonometrically, the relative heights deduced being applied to the absolute heights of their respective origins, at the base of the triangle, to give the absolute height of the station at the vertex. The two values thus obtained, by each side leading from the base to the vertex, invariably coincided so closely, that it seemed as if nothing more could be desired. Consequently the levels were not subjected to further scrutiny at the time, nor until the cumulative errors of Mr. Bunt's operations were known. They were then abstracted in circuits, as follows, when they were found to indicate a tendency to cumulative error, at an average rate of—1·47 inches, per 100 miles. Mr. Bunt's rate of error for this distance is—8·35 inches, on his line from Portishead to Axmouth.

Synopsis of Levels in Circuits round Triangles on Meridian 73°. *Season* 1855-56.

No.	Lengths of sides of Triangles in Miles.	Origin to Terminus.	Difference of Level in feet.	Error in Inches.
1	12·85	Kadar to Nar	—26·021	
	12·85	Nar to Kadar	+ 26·005	
	25·70		— 0·016	— ·19
2	12·85	Kadar to Nar	—26·021	
	14·53	Nar to Kothiala	+ 28·173	
	11·61	Kothiala to Kadar	— 2·249	
	38·99		— 0·097	—1·16
3	12·85	Kadar to Nar	—26·021	
	13·28	Nar to Jeto	—27·274	
	12·04	Jeto to Kadar	+ 53·093	
	38·17		— 0·202	—2·42
4	11·98	Jeto to Hazara	—18·630	
	13·92	Hazara to Goonia	+ 38·673	
	10·98	Goonia to Jeto	—19·984	
	36·88		+ 0·059	+ 0·71
5	10·53	Nar to Goonia	— 7·094	
	10·98	Goonia to Jeto	—19·984	
	12·04	Jeto to Kadar	+ 53·093	
	12·85	Kadar to Nar	—26·021	
	46·40		— 0·006	—0·07
6	10·72	Jeto to Bala	— 2·183	
	11·50	Bala to Hazara	—16·587	
	13·92	Hazara to Goonia	+ 38·673	
	10·98	Goonia to Jeto	—19·984	
	47·12		— 0·081	—0·97

Synopsis of Levels in Circuits round Triangles on Meridian 73°. Season 1855-56,—continued.

No.	Lengths of sides of Triangles in Miles.	Origin to Terminus.	Difference of Level in feet.	Error in Inches.
7	11·71	Hazara to Moogo	— 2·063	
	9·93	Moogo to Bala	+ 18·518	
	11·53	Bala to Hazara	— 16·587	
	33·17		— 0·132	— 1·58
8	9·93	Moogo to Bala	+ 18·518	
	10·21	Bala to Shahjamal	+ 7·243	
	9·12	Shahjamal to Moogo	— 25·756	
	29·26		+ 0·005	+ 0 06
9	9·12	Shahjamal to Moogo	— 25·756	
	10 74	Moogo to Futti	+ 16 910	
	11·78	Futti to Shahjamal	+ 8·813	
	31·64		— 0·033	— 0·40
10	10·74	Moogo to Futti	+ 16·910	
	10·89	Futti to Hoojan	— 20·991	
	11·46	Hoojan to Moogo	+ 4·146	
	33·09		+ 0·065	+ 0·78
11	9·33	Moogo to Lodri	— 19·375	
	9·27	Lodri to Hoojan	+ 15·185	
	11·46	Hoojan to Moogo	+ 4·146	
	30·06		— 0·044	— 0·53

Thus in 11 Sections there are 8 with — Errors amounting to 7·32 inches.
and 3 " + " " to 1·55 "

Giving a Mean algebraical Error of — 0·52 inches per circuit, averaging 35·5 miles in length, or — 1·47 inches per 100 miles.

20. Dr. Whewell observes—"It is very difficult to explain the cause "from which this seeming error arises, or even to conceive any cause from "which it can arise. The errors arising from the curvature of the earth, "and from any permanent refraction, are eliminated by the condition of "equal distances in the fore and back observations. The difference does "not seem to arise from the effects of the sun's rays on the instrument, "for it is not removed by shading the instrument with white paper; nor "from any rise of the peg between the fore and back observation, for it "is not confined to soft ground. It appears to go on increasing with "the time during which the observations are continued, and is such an "error as would result, if we suppose that in every interval of time "between the back and fore observation, something takes place by "which the staff is apparently (by refraction or otherwise) less elevated, "(or more depressed) at the fore observation than it had been at the "preceding back observation. For these elevations are supposed to be "equal in the process; and if the elevation of the fore point by refrac- "tion or any other cause be the smaller, the point will appear to be lower, "when it is really on the same level. This statement however is made "rather with a view of explaining the nature of this error than of assign- "ing its cause."

21. The cause is still unassignable, if indeed there is any one cause. Most probably there are several variable influences at work, whose effects differ under different circumstances. The following instances of minute errors succeeding each other all in one direction, so as eventually to accumulate to a gross quantity, indicate that the usually received maxim, of errors tending to cancel each other in a long line of operations, is not always to be implicitly accepted.

22. On examining the recorded bubble end readings of the operations given in the foot note to para. 19, the index error of the level was found to have a tendency to alter always in the same direction, during the observations at each station. Thus in one instance, taken at random out of many, the index error in the 2nd pair of observations at 47 consecutive stations, was found, when compared with its value for the 1st pair of observations, to have decreased 39 times, increased 5 times, and remained unchanged 3 times, the algebraical mean decrease being 1·2" (seconds of arc). This indicates a constant deviation, in the adjustment of the level to the axis of rotation, during the settlement of the instru-

north, (away from the sun) whenever necessary to counteract the tendency to droop in that direction. Otherwise, any error in the value of the run of the level, would affect the final results, by the same fraction of the accumulated corrections, that *it* is of the run. Still the sun's action must produce error, as it has a tendency to alter the position of the level, in the interim between the readings of the staff and bubble, by an amount which will vary with the direction of the line of operations, and the interval of time between the consecutive readings. Ordinary leveling operations seem to be peculiarly liable to this error, because the interval must necessarily be much longer, when the bubble is first adjusted, and the staff afterwards read, than when the bubble is read immediately after the staff has been observed. No modus operandi can wholly cancel such an error, though changes in the weather would do so more or less. This is one of a class of errors which are not shown up by working in a circuit. As long as their cause remains constant, they re-enter without attracting notice, to an equal extent in the up and down lines; thus the opposite extremes of a circuit, which closes without apparent error, may yet be considerably erroneous.

25. When first we became aware of Mr. Bunt's operations, the question arose whether we should adopt the system of circuits. It would have put a stop to working in concert, because the delay and expense of re-leveling 2,000 miles of a double or treble line, station by station, would have been intolerable. Each observer must have been apportioned certain sections, to level, by circuits, alone. But by so doing, a material guarantee against the possibility of casual errors would have been lost.

Simple as is the process of leveling, its very simplicity is painfully monotonous and wearisome. Erroneous staff readings ought to be immediately detected, if the results on the two pairs of faces are correctly subtracted. But they are so commonly found to coincide, that one is apt to overlook when they differ.

There are other mistakes, besides mis-readings, which are best guarded against by the co-operation of a second observer. What with the stupefaction caused by walking in circles round an instrument, in the bright glare of a broiling Indian sun, and the natural anxiety arising from the knowledge that a single error may mar the work of several years, it is evident that a system which guarantees freedom from casual

errors, while it affords mental relief to all concerned, could not be lightly abandoned.

26. Eventually a course was adopted, which is believed to combine the advantages of the double line and the circuit system. The observers continued to work in concert, as formerly, but leveled adjacent sections in opposite directions, thus canceling cumulative errors (of the kind described in paras. 16 to 19) on a long line of operations, as effectively as if each section were leveled up and down. This system, combined with the method of alternating observations at each station, seems to be the most perfect modus operandi possible.

27. It was often noticed, in re-leveling a station, that different results were obtained at different times of the day, especially when the rays of light grazed the ground in passing from the staff to the observer. On various occasions experimental observations were taken at different times of the day, to staves which were set up throughout the day, on firm pins. A tendency to a diurnal law of variation was found in settled weather, when the sun shone brightly, and the sky was clear and cloudless, but it was never found when there were any clouds. The results of two consecutive days' experiments are given below.*

28. Atmospheric influences must tend to cancel each other in a long line of operations, excepting under the following circumstances: *First.*—When operations are carried on more before than after noon, they are more under a sinking than a rising refraction. Consequently the first of a pair of staff readings will have a tendency to be more refracted than the second, thus introducing cumulative error, unless the precaution is taken to alternate the order of observations.

Secondly.—When operations are carried over a line of country which slopes uniformly in one direction, like the plains of Western India, sloping from the Himalaya Mountains to the sea, the rays of light from the

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* *Experimental observations at Hatidara, in Sind, on the* 10*th and* 11*th January* 1859.

Three instruments were placed side by side, on a line facing south-west, with their telescopes in the same horizontal plane. Three staves were set up to the south-west at distances of 2, 4, and 6 chains respectively, and three others to the north-east at similar distances, forming pairs of staves for observation. The ground had a slight slope from south to north. The instruments were on a ridge of sand about 1½ feet above the general level of the ground, the lowest staff reading being 4½ feet above the surface of the ground. Each staff was observed simultaneously by three persons. The differences

up staff, to the observer, are usually nearer the ground than those from the down staff, and they must therefore be more subject to extremes of refrac-

of the means so obtained on each pair of staves, from the general mean of the whole of the observations to the pair, are as follows:—

From Sunrise to Sunset of 11th January 1859.								Similarly on 10th January.		From both days combined.	
Staff A at 2 Chains.		Staff B at 4 Chains.		Staff C at 6 Chains.		$A+\frac{1}{2}B+\frac{1}{3}C=6$ Chains.		$A+\frac{1}{2}B+\frac{1}{3}C=6$ Chains.			
Times.	Differences from mean in feet.	Times.	Differences from mean in feet.	Times.	Differences from mean in feet.	Times.	Differences from mean in feet.	Times.	Differences from mean in feet.	Times.	Differences from mean in feet.
7-19 A. M.	+·0009	7-13 A. M.	+ 0003	7-1 A. M.	+ 0037	7-12 A. M.	+ 0023	8-34 A. M.	+ ·0007	7-12 A. M.	+·0023
7-48 "	+·0014	7-35 "	+ 0015	7-29 "	—0007	7-35 "	+ 0019	9-13 "	— 0006	7-35 "	+·0019
8-41 "	—·0012	8-36 "	+ 0003	8-30 "	0000	8-36 "	— 0010	9-53 "	—·0020	8-35 "	—·0002
8-58 "	—·0014	8-53 "	— 0005	8-48 "	— 0057	8-53 "	— 0036	10-14 "	— 0006	9-3 "	—·0022
11-14 "	—·0011	11-10 "	—·0035	11-6 "	— 0013	11-10 "	— 0033	12-19 "	— 0030	10-4 "	— 0013
3-4 P. M	+·0003	2-57 P. M.	—·0017	2-50 P. M.	— 0027	2-57 P. M	— 0015	1-49 P. M.	— 0027	11-10 "	—·0033
4-30 "	—·0002	4-25 "	+·0011	4-18 "	— 0010	4-25 "	0000	3-14 "	— 0006	12-19 "	—·0030
5-51 "	+ 0011	5-10 "	+·0025	5-13 "	+ 0074	5-12 "	+ 0048	4-28 "	+ 0011	1-49 P. M.	—·0027
								4-45 "	+ 0010	3-6 "	— 0011
								5-0 "	+ 0062	4-27 "	+ ·0006
										4-45 "	+·0010
										5-6 "	+·0055

tion, as already shown in para. 3. In India, there are fewer working hours before, than after the ground has been heated by the sun. Consequently the rays from the up staff must have an excess of negative refraction, compared with those from the down staff, and the result on an ascent would be to make it too small. The amount of this error will vary with the seasons; it is evidently beyond the control of the observer.

29. Personal errors alone remain to be noticed. They are probably connected more with the manipulation of the instruments, and with the reading or setting of the bubble, than with the staff readings, where they seem likely to become cancelled. In the case of one staff being invariably more or less illuminated than the other, as in working in a meridional direction, the difference of illumination may cause constant slight misreadings, tending to produce cumulative error. But the most probable locus of personal error is in the reading of the bubble. Owing to the level being usually above the telescope, and nearly in the same horizontal plane as the eye of the observer, he gets a side view of the bubble, refracted obliquely through the thickness of the glass tube, which is never satisfactory and sharply defined, as the look down view from above. The rim round the bubble, caused by the adhesion of the liquid to the sides of the tube, becomes so prominent, that its extremities may be read, instead of the ends of the bubble. When light falls obliquely on the instrument, the outer edge of the rim, towards the light, is more clearly defined than the inner, while at the opposite end of the bubble, the inner edge of the rim is most clearly defined. Consequently there is a tendency to bring the bubble too much towards the light, and to give the readings an erroneous bias, by an amount (equal to half the breadth of the rim), which might have a considerable effect on a long line of levels.

30. Much advantage may be expected from employing several observers and instruments, on operations of great extent. Their respective tendencies to a particular bias would probably cancel each other more or less. Changes of weather are also desirable for a similar reason, as being likely to counteract bias.

Every precaution is valuable which may prevent the accumulation of error. Thus in setting up the instrument, its Tangent screw, if towards the back staff at one station, should be turned towards the forward staff at the next, so as to anticipate the possibility of error, from

the axis settling invariably into a particular position in its socket. If the instrument is carried with its object end forward to one station, to the next the eye end might be carried forward. The carriers can easily be trained to make these variations in regular succession, without requiring supervision.

31. The final results of the leveling operations on the Indus are comprised in three Sections. First, a line, 310 miles long, from Maru Pir, Tower Station, in Upper Sind, to Dehra Ghazi Khan, executed in concert by three observers. In 228 miles, which were done before the introduction of the system of alternating the order of observations, (para. 22), the extreme difference between observers accumulated to ·33 of a foot, while in the subsequent 82 miles it amounted to ·49, and became ·72 at the terminus. At the 117th mile, two of the observers interchanged instruments. Thus a second set of results is deducible, as between instruments, rather than persons; the extreme difference of these, amounts at the terminus to ·98 feet. The order of rotation of the different observers was frequently changed, and often with the apparent result of reducing the differences.

32. The second Section is from Maru Pir, Tower Station, in Upper Sind, down to the mean sea level at Karachi. It is 301 miles long, and was done by two persons, alternating the order of observations (para. 22), and working adjacent Sections in opposite directions (para. 26). The cumulative difference in 147 miles of Up Line, (from the sea towards the Himalayas) is ·448 feet, and in 154 miles of Down Line, 1·390 feet. The final difference at the terminus is ·942 feet. Throughout this operation the same person invariably led, and there was no exchange of instruments.

33. The third Section is from Dehra Ghazi Khan, to the Chuch Base Line, near Attok. It is 360 miles long, and was executed by two observers, alternating the order of observations, but working continuously in one direction. A considerable portion of this operation crosses the Hill Districts of Jhelum and Rawul Pindi. There was no prospect of completing the Section in a single season, had the direction of operations been reversed in alternate Sections, as this would have involved 360 miles additional marching. Consequently the less rigorous system of working continuously in one direction was adopted, in order to avoid the delay and expense of protracting the operations into a second season,

for the sake of a refinement which would certainly not alter the final result by one foot. This Section does not form a part of the great circuit from sea to sea viâ Delhra Dhoon, and therefore its accuracy is of minor importance. The results obtained by the two observers were singularly accordant, their maximum divergence never exceeding ·35 feet, and dwindling down at the terminus to ·01. Each observer retained his own instrument throughout, but sometimes one led, sometimes the other.

34. Subsequently another Section of the main circuit was carried from a point on the Indus Levels, near Mittunkote, to Umbala, a distance of 440 miles, by two observers, alternating the order of observations, and the direction of work, in adjacent Sections. Their cumulative difference in the Up Line, (220 miles) is 0·057 feet, and in the Down Line, 0·584 feet, the total difference at the terminus being 0·527 feet. The instruments were interchanged at the 187th mile. Each observer led, and the other followed in regular rotation. The terminal difference between the instrumental results is 0·209 feet.

35. On this curious and perplexing subject, Captain Branfill reports as follows :—

"I think we can all subscribe to the following facts. The state of "the weather and the season of the year have a very considerable effect on "our results, as shown by the difference between observers. We have "found that the apparent law of our differences is least developed some "time in the middle of the cold season. In a run of bad weather (i. e., "bad for the work) the apparent law of our difference is, for the most "part, marked when the atmosphere is clearest, and when we have sup-"posed our observations to be freest from error; and conversely in a run "of good weather, when the air is hazy from smoke or dust, or greatly "agitated by wind, and, in short, when we have found most difficulty in "reading the staves, our results have most coincided with each other. Our "differences do not appear to vary with the distances of the staves. "On the contrary, they are perhaps even more marked as the day "grows older, and the distances of the staves from the instrument are "reduced. The general direction in azimuth of the line of our work has "some connection with the cumulative differences, and we have noticed "that the tendency to differ is more marked when proceeding *towards* a

" certain point of the compass, than when proceeding *from* that point to-
" wards its opposite."

36. Since the alternating system of observations has been introduced, it has been a rule to take the first pair of observations to the black faces when the back staff has been first read, and to the white faces when the forward staff has been first read. Thus, at each station, the black faces are made to carry a forward line, and the white faces a back line. When instrumental error exists, these two lines will gradually diverge from each other, by an amount which is no bad test of the performances of the instrument, as well as of the advantages of the system of alternating. Thus, in the Section Maru Pir, Tower Station, to Karachi, 301 miles long, No. 4 Level gave results from black faces greater than those from white, by the following quantities :—At the 48th mile by ·111 feet; at the 100dth by ·151; at 151st by ·187; at 199th by ·238; at 248th by ·309; and at terminus by ·445; showing a very steady tendency to cumulative error, at the minute average rate of +·074 feet per 100 miles. Numerous similar instances can be given of differences between black and white faces accumulating with equal regularity, but the rate of error rarely exceeds the above minute amount.

37. The larger differences in the levels executed for the British Association may perhaps be due to the following circumstances :—First, the use of a single staff. With a pair, the back and forward readings can be taken in rapid succession, in order that the operation may be as strictly differential as possible. Whereas, with his single staff, Mr. Bunt must probably have waited at least 10 minutes, and often much longer, between the back and fore observations at each station. The first would be taken immediately on setting up the level, and the second, after an interval sufficiently long, to allow the relative position of the bubble and the telescopic axis to become slightly altered, by settlement, and thus introduce cumulative error, by an invariable sequence of cause and effect.

Secondly, the *vane*-staff which he employed, though fitted with a Vernier, reading to one-tenth of the smallest quantity estimable on a *reading*-staff, was liable to a zero error, by the friction of the vane on the staff, making the Vernier read too high when lowered, and too low when raised. It would enter whenever the motion of the vane at the back observation was reversed at the forward. Though it would be cancelled by working in a circuit, at each station of its occurrence the results

obtained from the up and down line would differ by four times the zero error of a single reading. The cumulative effect of this error, on a long line, would depend on there being a preponderance of slopes in one direction.

IV.—General Observations.

38. The Survey bench-marks at Kotree in Lower Sind, and Shikarpoor in Upper Sind, were connected with the main line of levels of the Canal Department, which had been leveled three times, over a period of several years, in several sections, and by many persons, and may therefore be expected to be free as well from cumulative as from casual errors. The closing difference of the Canal and Survey Levels is 0·09 feet in a circuit of 550 miles.

39. The average daily rate of progress of each party is four miles on open level ground. The average annual out-turn of work is 354 miles of a double or treble line, besides occasional short branches to connect places of importance. The daily duration of operations in the field is rarely less than six hours, often much more. The staves are set up at distances of 8 to 10 chains of links, from the instrument, in the morning, and four to five chains, later in the day. At 10 chains, ·001 of a foot is easily estimable, with a power of 40, when the atmosphere is clear and steady. Twice that quantity is with difficulty estimable at half the distance in the heat of the day, when the staves appear to dance, and the irradiation of the white divisions over the black, causes much distortion in the appearance of the divisions, and greatly increases the difficulty of reading.

40. Errors of unit of length are determined by comparing the staves, at intervals during the field season, with a portable iron bar, whose length is known in terms of the Standard of the Trigonometrical Survey.

41. During the course of the operations, the Karachi harbor, and several large rivers were crossed. The longest distance, between instrument and staves, was 34 chains (of links), which occurred at Karachi; over rivers, the distances were rarely more than 17 chains. The uniformity and steadiness of the strata of the atmosphere, over a large body of water, enable satisfactory readings to be taken at distances which would be hopelessly impracticable over land.

In 1856 the River Chenab was crossed at three points, where experiments were made to determine the amount of error to which one is liable in referring to the surface of a river, at the opposite extremities of a section across, when the breadth is too great, for a staff, on one bank, to be read from the other. Sections were selected at right angles to the stream, and pools were dug in the sand on each side, to obtain an unagitated surface of water for reference. The results, by direct leveling, differed from those referred to the margin of the stream, by 0·032, 0·039, and 0·074 feet, respectively, in the three instances, giving an average error of ·048, the average breadth of river being 12 chains.

42. That the Survey Levels might be made as generally and permanently useful as possible, care has been taken to leave bench-marks, at distances of about 10 miles apart, along the whole line. These usually consist of solid pyramidal blocks of stone, weighing about 3½ maunds each, so that a pair form a convenient load for a camel. They are invariably buried for safety, their tops being left flush with the ground level. A pile of earth is raised over the stone, and three mounds are erected around, to attract the attention of any person in search of the mark. All the Trigonometrical Survey Stations within reach, as well as all the Canal and Railway bench-marks, and all permanent milestones, in the neighbourhood of the operations, have been duly connected, with the main line of levels.

43. The experience gained in these operations is not without significance as regards ordinary leveling, for which great accuracy is not desirable. We have seen how circuits may close without apparent error, and yet their opposite extremities be widely erroneous. Also, on the other hand, how, without any blunder being made, they may close with large apparent error, resulting from an accumulation of small, and almost imperceptible errors, beyond the control of the observer. Whether the closing error of a long line of operations is cumulative, or accidental, must always be very doubtful. Much desultory leveling is often executed in order to solve such doubts. Accidental errors are the most important, and are best guarded against by employing pairs of levelers with independent instruments and staves, the staves being figured and divided in the manner described in para. 10. Cumulative error may be guarded against, by the co-operation of two or more observers, working in succession over the same line, by alternating the order of observations at each station, and

the direction of operations in adjacent sections, and by executing different portions of the main line with different instruments, and if possible at various seasons of the year. When these precautions are observed in the main line of levels, it will be a reliable basis for all other operations, and the time and trouble spent in making it as perfect as possible, will probably be more than repaid, in the long run.

44. The Survey Levels cannot be verified by connexion with the sea, in the Bay of Bengal, until 8 or 900 more miles of line have been leveled. This will occupy an ordinary party during the whole of at least two field seasons. Meanwhile the results have been approximately verified by connexion with the Railway Levels brought up from Calcutta, which have for their datum the sill of Howrah Dock. The results are as follows :—

Stations.	By Railway.	By G. T. Survey.
	Datum—Howrah Dock.	Datum—Mean Sea—Karachi.
Kunowe Deota Level Crossing ...	+ 647·64	+ 624·77
Allygurh—Engine House ...	+ 632·14	+ 608·75
Agra—Goods Station Platform ..	÷ 540·68	+ 516·26

The Railway values are, on an average, 23·56 feet greater than those of the Survey. Part of this is due to difference of data. The sill of the Howrah Dock has been found to be 3·07 feet below the sill of Kidderpoor Dock, by observations recently made by Mr. J. P. Doyle, Civil Engineer, at the request of the Survey Department. The sill of the Kidderpoor Dock is 8·58 feet below mean sea level, as determined from several years' observations, of high and low water, at the Dock. Hence the sill of the Howrah Dock is 11·65 feet below mean sea level, by which amount the Railway values should exced those of the Survey. But as they are 23·56 feet in excess, an error of 11·91 feet has apparently been generated, either in the Survey Levels, between Karachi and Agra, or in the Railway Levels, between Calcutta and Agra, supposing

the mean sea level of Karachi harbour to be the same as that of Kidderpoor Dock.

45. In the following Tables, the heights of several hill stations of the survey are given, as they may be of use to enable Scientific Observers and Travellers to verify Barometers and other hypsometrical instruments, and to determine their zero errors.

46. This introductory Memorandum cannot close more fitly than by recording that the Survey Levels were principally executed by Captain Branfill and Mr. Carty, of the Trigonometrical Survey, to whose ability, energy, and perseverance, the large out-turn of work each season is chiefly due.

Suggestions regarding the connection of Canal, Railway, and other Levels, with those of the Trigonometrical Survey.

The object in view is two-fold—reduction to a common datum, and verification. Connection with a single point, whose height has been determined by the Spirit Leveling operations, is sufficient for the first purpose. But when trigonometrically determined points have to be referred to, the connection should be made with as many of them as possible, and the mean difference between their values above mean sea, as given in these Tables, and the values above the datum of the line of levels to be connected, will be the constant to apply to the latter, to reduce them to the common datum. Thus, in the instance given at para. 44, of the description of the Survey Levels, a correction of—23·56 feet is necessary, to reduce the Railway Levels, at Agra and Allygurh, to the Survey Datum.

Where great accuracy is required, and the Survey Levels are referred to at more than one point, for verification, as well as connection with the sea, it will be advisable, when discrepancies occur, to ascertain whether they are due to the unit of the staves being different from that of the survey, or to the presence of cumulative and accidental errors. An instance has been met with of a difference of unit amounting to half an inch on a ten-feet staff, or one-half per cent., which would have a considerable influence in causing differences. But in general, the lengths of ordinary leveling staves have been found to coincide, very closely, with those of the survey.

When discrepancies of height are due to differences of unit, the corrections must be proportional to the height actually measured, by the staves whose units differ from those of the survey; but when they are cumulative or accidental, corrections should be distributed over each station of the line of levels, in proportion to its distance from the station of junction with the Survey Levels.

SPECIMEN OF FIELD BOOK OF LEVELING OPERATIONS, G. T. SURVEY.

LEVELING OPERATIONS, SECTION KALIANPOOR-KALIANA. GREAT ARC SERIES, G. T. SURVEY, SEASON 1861-62.

Forward Section Jorah Village to Deori Village, with No. 3 Standard—value of 1 Division of Scale 1″·709.

Rule for Correcting Dislevelment.—*Consider Back End level readings to be — and Forward End to be +. Find their Difference and enter it with sign of whichever is greatest. Half the Algebraical sum of the Differences is the quantity for which a correction is to be taken from Subtense Tables. The Correction to have the same sign as the Half Sum.*

	Station Nos. and Staff Positions.	Distances and Bearings of Staves from Instrument.	Level Readings—Dislevelment and Corrections. Back End—	Forward End +	Differences.	½ Sum.	Corrections.	Staff Readings.	Approximate Differences of Level. Rise +	Fall —	Corrected Differences of Level. Rise +	Fall —	Levels reduced to Origin.	Remarks.	Cumulative level corrections.
Staff F	Back ...	5·00	74·5	71 6	— 2·9	...	...	12·755						Commenced forward section on yesterday's initial picket, having first tested the stability of it by re-observing station 1 of that day, 11th February 1862.	
" E	Forward ...	5·00	69·0	77·1	+ 8·1	...	...	12·232	0·523	...	0·530				
	1			Sum	+ 5·2	2·60	+ 7								
	Back ...	334°	73·3	72·7	— 0·6	...	...	7·202	0·537	...	0·531				
	Forward ...	160	74·9	71·0	— 3·9	...	...	6·665							
				Sum	— 4·5	2·25	— 6	...	...	...	0·531	...	+ 0·531		+ 1
	Back ...	8·00	79·5	67 3	— 12·2	...	...	12·215							
	Forward ...	8·00	69·8	77·0	+ 7·2	...	...	11·155	1·060	...	1·049				
	2			Sum	— 5 0	2·50	— 11								
	Back ...	338°	74·5	72·7	— 1·8	...	...	6·645	1·040	...	1·051				
	Forward ...	159	70·1	76·8	+ 6·7	...	...	5·605							
				Sum	+ 4·9	2·45	+ 11	...	...	...	1·050	...	+ 1 581		+ 1
	Back ...	10·00	73·9	73·1	— 0·8	...	...	11·234							
	Forward ..	10·00	74·6	72 3	— 2·3	...	...	11·755	...	0·521	...	0·529			
	3			Sum	— 3·1	1·55	— 8								
	Back ...	340°	73·9	73·1	— 0·8	...	...	5·686	...	0·539	...	0·528			
	Forward ...	158	71·0	76 0	+ 5·0	...	...	6·225							
				Sum	+ 4·2	2·10	+ 11	...	...	...	...	0·529	+ 1·052		+ 2
Staff E	Back ...	11·24	76·1	70·4	— 5·7	...	...	9·334						Forward Staff F on Stone Bench Mark imbedded at Peepulwala Chowkey in lands of Jorah or Jori Village. The stone is about 100 feet west of the high road and 50 feet west of a Peepul tree, under which a Road Chowkey has been placed.	
" F	Forward ...	11·24	70·3	76·0	+ 5·7	...	...	8·196	1·138	...	1·138				
	4			Sum	0·0		0								
	Back ...	335°	76·4	69·4	— 7·0	...	...	3·785	1·141	...	1·130				
	Forward ...	154	71·4	74·9	+ 3·5	...	...	2·644							
				Sum	— 3·5	1·75	— 11								
	Back ...	...	76·7	69·0	— 7·7	...	...	9·336						Repeated on account of discrepancy between first and second results. The general mean of all the observations is the value finally adopted.	
	Forward ..	...	70·4	75·1	+ 4·7	...	...	8·195	1·141	...	1 132				
	Repetition.			Sum	— 3·0	1·50	— 9								
	Back ...	...	73·0	72·5	— 0·5	...	...	3·766	1·121	...	1·133				
	Forward ...	...	70·5	75·0	+ 4·5	...	...	2·645							
				Sum	+ 4·0	2·00	+ 12	...	...	Mean.	1·133	...	+ 2·185		0
	Back ...	10·50	72 0	71·5	— 0 5	...	...	9·075							
	Forward ...	10·50	69·7	73 9	+ 4·2	...	..	10 414	...	1 339	...	1·328			
	5			Sum	+ 3·7	1·85	+ 11								
	Back ...	348°	71·4	72·1	+ 0·7	...		3·524	...	1·341	...	1·326			
	Forward ...	155	69·9	74·1	+ 4·2	...	...	4·865							
				Sum	+ 4·9	2·45	+ 15	...	...	...	...	1·327	+ 0·858		+ 14
	Back ...	10·00	71·0	71·2	+ 0·2	...	...	10 855							
	Forward ...	10·00	69 4	72·3	+ 2·9	...	...	10·635	0·220	...	0·228				
	6			Sum	+ 3·1	1·55	+ 8								
	Back ..	338°	72·9	68·9	— 4·0	...	...	5·324	0 238	...	0·235				
	Forward ...	156	69·2	72·2	+ 3·0	...	...	5·086							
				Sum	— 1·0	·50	— 3	...	....	...	0 232		+ 1·090		+ 17
	Back ..	10·00	72·9	66·1	— 6·8	...	..	10·134							
	Forward ...	10·00	66·6	72·0	+ 5·4	...	...	11·235	...	1·101	...	1·105			
	7			Sum	— 1·4	·70	— 4								
	Back ..	339°	73·0	66·1	— 6·9	...	...	4·585	...	1·100	...	1 106			
	Forward ...	157	67·3	72·0	+ 4·7	...	...	5·685							
				Sum	— 2·2	1·10	— 6	...	...	...	...	1·106	— 0·016		+ 12
	Back ...	10·00	74·0	63·0	— 11·0	...	...	8·556							
	Forward ...	10·00	66·0	70·3	+ 4·3	...	...	10·775	...	2·219	...	2·237			
	8			Sum	— 6·7	3·35	— 18								
	Back ...	338°	69·8	66 5	— 3·3	...	...	2·985	...	2·241	...	2 237			
	Forward ...	158	65·7	70·5	+ 4·8	...	...	5·226							
				Sum	+ 1·5	·75	+ 4	...	...	...	...	2·237	— 2·253		+ 5
	Recorded by			Examined by					Totals ...		2·946	5·199	— 2·253	Leveled by	

TABLES OF HEIGHTS.

REFERENCES.

The Latitudes and Longitudes herein given are extracted from the operations of the Great Trigonometrical Survey.

The Latitudes are referrible to the Kalianpur Observatory, near the Sironj Base Line, in Central India.

The Longitudes are referrible to the old value of the Madras Observatory, viz., 80° 17′ 21″, to which a correction of—3′ 25″·5 is applicable, to reduce to the value adopted by the Admiralty, and the Royal Astronomical Society, or —3′ 1″·8 to reduce to the results of Taylor's Observations up to 1845.

The stations of the Survey, when on hills or high mounds, consist of a circular masonry pillar, from 3 to 4 feet in diameter, for the large theodolites to rest on, surrounded by a platform, from 10 to 12 feet square, on which the observatory tent is pitched. Being invariably placed on the highest accessible point, they rarely require to be raised more than 2 or 3 feet.

In the plains, when mounds are not available, Tower Stations have to be built. They consist of a central masonry pillar, surrounded by a mass of unburnt brick-work, rising flush with the pillar, to serve as a platform for the tent and observers. All Towers of recent construction have their pillars perforated vertically, in order that reference may be made to the ground level, where the markstone is placed. There is then no upper markstone, and the heights are consequently referred to the surface of the pillar.

H. S. stands for a Hill Station.

P. S., or simply S, for a Platform Station, on a mound in the plains.

T. S. for a Tower Station.

SECTION I.

From Mean Sea Level, Karachi Harbor, to Kasmore.

The Mean Sea Level was determined by tidal observations, extending over two semi-lunations, on a guage in the Manora Harbor, within a few feet of the Manora Bench Mark. The levels were carried across the harbor and creek, to the Observatory on Bath Island, and thence to the Karachi Church, and the south end of the Great Trigonometrical Survey Base Line. Then along the main road to Sehwan, viâ Gara, Gooja, Tattah, Jerruk, and Kotri. There are substantial milestones all along this road, almost the whole of which have been connected. At Sehwan, the levels leave the main road, and turn westwards, along the northern margin of the Munchur Lake, to Mirkhan T. S., where the principal triangulation descends into the plains of Upper Sind. They follow the sides of the triangles, viâ Mehur, Larkhana, and Shikarpoor, as far as Kundkote T. S., and then take the frontier road onwards to Kasmore. The heights of the principal stations which are not determined directly by the leveling operations, are deduced trigonometrically from the nearest leveled station.

Sind from Manora Harbor to Kasmore.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Manora Bench Mark ... Lat. 24° 47′ 51″. Long. 67° 1′ 5″.	9·30	...	B. M. bears S. 117°, and is 139 yards distant from the north-west corner of the Naval Storehouse, near the old jetty. It was connected with the mean sea level of Karachi Harbor in the year 1855, by a series of tidal observations, extending over two semi-lunations. It consists of a round paka pillar, 3 feet in diameter, flush with the ground level, with markstone in centre. It is surmounted by a pile of dressed stonework, with one large exterior slab engraved G.T.S. / B.M.
Karachi Observatory ... Lat. 24° 49′ 50″. Long. 67° 4′ 2″.	35·44	...	Surface of paka pillar in east room.
Karachi Church ... Lat. 24° 51′ 9″. Long. 67° 4′ 15″.	27·55	...	Top step of front entrance, corresponding with its floor.
2 Milestone (On road from Karachi to Tattah.)	21·61	...	Summit of stone.
3 "	27·24		
4 "	31·84		
5 "	28·75		
6 "	29·24		
7 "	35·14		
South end, Karachi Base... Lat. 24° 53′ 0″. Long. 67° 11′ 52″.	46·38	...	To surface of pillar containing the ground level markstone.
North end Karachi Base ... Lat. 24° 58′ 45″. Long. 67° 14′ 51″.	204·40	...	Ditto ditto.
Mutrani H. S. ... Lat. 24° 55′ 13″. Long. 67° 7′ 20″.	...	253·3	*Upper Surface Markstone.*—Is situated on a peak on the range of low hills between Karachi Observatory and the Base Line. The road from Karachi to Tattah passes to the south of the station, and that from Karachi to Kotree, through the hills to the north of it.

Sind from Manora Harbor to Kasmore.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
A. H. S. ... Lat. 24° 55′ 22″. Long. 67° 1′ 43″.	...	418·0	*Upper Surface Markstone.*—Is situated on a peak slightly west of the direction of the streets in Karachi Cantonments. It is a conspicuous point, being higher than any other in the neighbourhood.
Muggur Pir H. S. ... Lat. 24° 59′ 16″. Long. 67° 3′ 56″.	...	585·2	*Upper Surface Markstone.*—It is situated on the hill of Muggur Pir, on the range of low hills that constitutes the east side of the Hubb valley, the Pubb range forming the west. The platform is 3 feet high, and adjoins a conical stone tomb on the south-east side. The double-domed masonry kooba of Muggur Pir is about 0·9 miles to the south-east by east.
Bole H. S. ... Lat. 24° 54′ 37″. Long. 67° 23′ 11″.	...	491·5	*Upper Surface Markstone.*—It is on the highest and centre of three knobs on a hill about three miles north-east of Gagar, the second halt on the hill road from Karachi to Kotree. It is in the Karachi Collectorate. The pillar is 3 feet high.
9 Milestone (On road from Karachi to Tattah)	47·32	...	Summit of stone.
10 "	61·22		
11 "	77·42		
12 "	72·44		
13 "	93·97		
14 "	123·59		
15 "	135·60		
16 "	115·08		
17 "	100·96		
18 "	84·92		
19 "	79·23		
21 "	54·44		
G. T. S. Bench Mark ...	52·38	...	B. M. bears 202°, and is distant 176 feet from XXI Karachi milestone. Summit of B. M. about 6 inches above ground level, covered with a pile of earth.
22 Milestone (On road from Karachi to Tattah)	33·44	...	Summit of stone.
23 "	17·45		
24 "	43·92		
25 "	7·74		
26 "	13·69		
27 "	9·69		

Sind from Manora Harbor to Kasmore.

Names of Stations.		Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
28 Milestone	On road from Karachi to Tattah.	7·53	...	Summit of stone.
29 "		8·00		
30 "		9·24		
31 "		12·98		
32 "		9·11		
33 "		10·08		
34 "		18·61		
35 "		9·65		
36 "		13·16		
37 "		13·62		
G. T. S. Bench Mark at Gara		8·06	...	B. M. sunk south of road, bears 197°, and is 224 feet from 37th milestone near the village of Gara. It is sunk 2¼ feet below ground level, and covered with a mound of earth.
12 Gooja / 0 Gara Milestone	On road from Karachi to Tattah.	17·29	...	Summit of stone.
11 Gooja / 1 Gara "		15·79		
10 Gooja / 2 Gara "		15·19		
9 Gooja / 3 Gara "		14·85		
8 Gooja / 4 Gara "		16·73		
7 Gooja / 5 Gara "		18·02		
6 Gooja / 6 Gara "		19·37		
Canal Bench Mark ...		15·73	...	Summit of Canal B. M. marked XII, about 50 yards north of road and 120 yards south-east of milestone 6 Gooja / 6 Gara.
5 Gooja / 7 Gara Milestone	On road from Karachi to Tattah.	18·88	..	Summit of stone.
4 Gooja / 8 Gara "		20·28		
3 Gooja / 9 Gara "		21·72		
2 Gooja / 10 Gara "		23·69		

Sind from Manora Harbor to Kasmore.

Names of Stations.			Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
1 Gooja / 11 Gara	Milestone	On road from Karachi to Tattah.	23·93	...	Summit of stone.
0 Gooja / 12 Gara	"		21·44		
10 Tattah / 0 Gooja	"		22·47		
9 Tattah / 1 Gooja	"		25·01		
8 Tattah / 2 Gooja	"		24·66		
7 Tattah / 3 Gooja	"		24·24		
6 Tattah / 4 Gooja	"		25·28		
5 Tattah / 5 Gooja	"		26·31		
4 Tattah / 6 Gooja	"		27·91		
3 Tattah / 7 Gooja	"		27·08		
2 Tattah / 8 Gooja	"		71·43		
0 Tattah / 10 Gooja	"		30·45	...	Summit of stone at west entrance of Tattah.
G. T. S. Bench Mark at Tattah.			38·87	...	*At Tatta.*—The B. M. is embedded in mound on which Tattah Dâk Bungalow is built. It is 158 feet from $\frac{\text{XXXII Jurruk}}{\text{0 Tattah}}$ milestone, and 112 feet from north angle of Travellers' Bungalow, and 150 feet from south-east angle of compound of Mookhtiarkari, and Sowars' lines. The B. M. is a block of stone 3 feet 5 inches high, 13 inches across at top; octagonal shaped, and evidently intended for part of a verandah pillar. The upper surface of the B. M. is 2 inches below the level of the ground, at the spot where it is buried. It is covered with a pile of bricks and earth several feet high.

Sind from Manora Harbor to Kasmore.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
32 Jerruk / 0 Tattah Milestone (On road from Tattah to Jerruk.)	35·46	...	At north entrance to Tattah. Summit of stone.
31 Jerruk / 1 Tattah "	33·43		
30 Jerruk / 2 Tattah "	34·15		
29 Jerruk / 3 Tattah "	35·09		
28 Jerruk / 4 Tattah "	33·73		
27 Jerruk / 5 Tattah "	31·41		
26 Jerruk / 6 Tattah "	30·33		
25 Jerruk / 7 Tattah "	28·73		
G. T. S. Bench Mark at Chilia.	41·98	...	*At Chilia.*—Top of stone 3 inches above ground level, near Chilia Dhurrumsala, 10 paces east of road, and 43 paces from north-west angle of Dhurrumsala. Covered with a pile of earth and stones.
24 Jerruk / 8 Tattah Milestone (On road from Tattah to Jerruk.)	74·14	...	Summit of stone.
23 Jerruk / 9 Tattah "	71·84		
22 Jerruk / 10 Tattah "	60·86		
21 Jerruk / 11 Tattah "	72·50		
20 Jerruk / 12 Tattah "	62·36		
19 Jerruk / 13 Tattah "	53·81		
18 Jerruk / 14 Tattah "	50·95		
17 Jerruk / 15 Tattah "	40·25		
16 Jerruk / 16 Tattah "	41·43		
15 Jerruk / 17 Tattah "	43·18		
14 Jerruk / 18 Tattah "	43·58		

Sind from Manora Harbor to Kasmore.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
13 Jerruk / 19 Tattah, Milestone, On road from Tattah to Jerruk.	42·63	...	Summit of stone.
12 Jerruk / 20 Tattah, "	45·00	...	Summit of stone.
11 Jerruk / 21 Tattah, "	44·45	...	Summit of stone.
10 Jerruk / 22 Tattah, "	42·76	...	Summit of stone near the "Jamwah," a canal passing near Soonda village.
Canal Bench Mark near Soonda.	38·25	...	B. M. inscribed II. It lies on the east of the road, and is surrounded by three mounds and a ditch, opposite the village of Soonda, which is west of the road.
8 Jerruk / 24 Tattah, Milestone, On road from Tattah to Jerruk.	65·90	...	Summit of stone.
7 Jerruk / 25 Tattah, "	77·13	...	Summit of stone.
6 Jerruk / 26 Tattah, "	133·08	...	Summit of stone.
5 Jerruk / 27 Tattah, "	93·34	...	Summit of stone.
4 Jerruk / 28 Tattah, "	79·96	...	Summit of stone.
3 Jerruk / 29 Tattah, "	46·50	...	Summit of stone.
2 Jerruk / 30 Tattah, "	47 25	...	Summit of stone.
1 Jerruk / 31 Tattah, "	81·90	...	Summit of stone.
Lamp pillar, Jerruk ...	87·37	...	To summit, which is on the third course of masonry. Masonry of pillar is 3 feet high, by 2 feet 2 inches square, in three courses, each 1 foot high. The pillar is at the junction of the roads from Tattah and Kotri, at a distance of 143 feet from Milestone $\frac{\text{0 Jerruk}}{\text{24 Kotree}}$, and 123 feet from Milestone $\frac{\text{0 Jerruk}}{\text{32 Tattah}}$. The two milestones are 60 feet apart.

Sind from Manora Harbor to Kasmore.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
G. T. S. Bench Mark, at Jerruk ...	84·25	...	Buried in south angle of compound of Jerruk Dhurrumsala, at a distance of 5 feet from the adjacent walls. The B. M. is of white limestone from Sukkur; its bottom is on solid rock, 8 inches below general level of ground; it is bedded in a platform of stone and lime masonry, 3¼ feet square and 2 feet high. The top of the B. M. is 2 feet 4 inches above solid rock.
0 Jerruk, 24 Kotri Milestone (On road from Jerruk to Kotri)	87·09		
23 Kotri, 1 Jerruk " (On road from Jerruk to Kotri)	77·52		
22 Kotri, 2 Jerruk " (On road from Jerruk to Kotri)	67·54		
21 Kotri, 3 Jerruk " (On road from Jerruk to Kotri)	63·67		
20 Kotri, 4 Jerruk " (On road from Jerruk to Kotri)	55·32		
19 Kotri, 5 Jerruk " (On road from Jerruk to Kotri)	45·78		
18 Kotri, 6 Jerruk " (On road from Jerruk to Kotri)	51·73	...	Summit of stone.
17 Kotri, 7 Jerruk " (On road from Jerruk to Kotri)	55·46		
16 Kotri, 8 Jerruk " (On road from Jerruk to Kotri)	55·99		
15 Kotri, 9 Jerruk " (On road from Jerruk to Kotri)	50·52		
14 Kotri, 10 Jerruk " (On road from Jerruk to Kotri)	61·97		
13 Kotri, 11 Jerruk " (On road from Jerruk to Kotri)	54·93		
12 Kotri, 12 Jerruk " (On road from Jerruk to Kotri)	58·33	...	Summit of stone lettered K.
11 Kotri, 13 Jerruk " (On road from Jerruk to Kotri)	65·12	...	Summit of stone.
8 Kotri, 16 Jerruk " (On road from Jerruk to Kotri)	76·64		

Sind from Manora Harbor to Kasmore.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	Remarks and Descriptions of Stations.
7 Kotri / 17 Jerruk } Milestone ...	79·45	...	Summit of stone.
6 Kotri / 18 Jerruk } "	85·02		
5 Kotri / 19 Jerruk } "	83·84		
4 Kotri / 20 Jerruk } "	79·15		
3 Kotri / 21 Jerruk } "	71·85		
2 Kotri / 22 Jerruk } "	65·36		
1 Kotri / 23 Jerruk } "	67·98		
Wooden River Guage, Kotri	63·96	...	Summit, which is 19·64 feet above Zero.
Mooring Gun, Kotri ...	66·23	...	The summit of most northern gun, used as a mooring post, on bank of river at Kotri.
Railway Bench Mark, Kotri	66·49	...	B. M. is imbedded where the Tramway to the river crosses the road to Sehwan, at a distance of about 15 paces south-west from the angle of junction.
Bolalio H. S. ... Lat. 25° 8′ 56″. Long. 67° 23′ 53″	...	1,091·1	*Upper Surface Markstone.*—It is situated at the highest eminence on the eastern edge of the hill, which looks towards the south, on the plain in which the base line lies; on all other sides it is surrounded by an extremely wild hilly country, and is very difficult of access. A river named Tudda flows round the foot of the hill, about three miles distant. The ascent is practicable on that side. The nearest village is Mooreed-ka-gote, about eight miles to the west. The masonry pillar is 3 feet high.
Myo H. S. ... Lat. 25° 10′ 56″. Long. 67° 7′ 50″.	...	780·2	*Upper Surface Markstone.*—It is a peak of that name on one of the ranges of low hills that constitute the eastern side of the valley through which the Hubb River flows, the high range of the Pubb Mountains forming the western side. The platform is 3 feet 2 inches high.

Sind from Manora Harbor to Kasmore.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Ghati H. S. Lat. 25° 20′ 17″. Long. 67° 16′ 33″. ...	...	1,551·8	In the Karachi Collectorate. Is situated on the northernmost of three peaks on the Hill of Ghati. The platform is 3 feet above the surface of the ground. The only ascent is by a steep road on the eastern side of the hill.
Tumbar H. S. Lat. 25° 27′ 54″. Long. 67° 3′ 21″. ...	...	2,675·2	In the Khelat Territory. Is situated on the highest point of the Pubb Range in the neighbourhood. The name is variable and may be Timmur, Tumar, Tumru, &c. The road is from the north-east side of the hill.
Rahuja H. S. Lat. 25° 24′ 30″. Long. 67° 32′ 47″.	..	1,570·5	In the Karachi Collectorate. Is situated on a peak near the south-east point of the Hill Rahuja. The platform is 3 feet high.
Myher H. S. Lat. 25° 31′ 54″. Long. 67° 21′ 28″. ...	...	1,559·7	In the Karachi Collectorate. Is situated on the brink of the steep face of Myher Hill, overlooking the Hubb River. The road from Tumbar to Myher ascends the hill at a pass about six miles south of the station. There is only one other pass on the Ghati road. There are no villages near, but a fakir's hut about half way to Ghati. The platform is 3 feet high.
Khato H. S. Lat. 25° 46′ 56″. Long. 67° 11′ 9″. ...	...	3,270·7	In the Khelat Territory. Is situated on the highest point of the hill of the same name. The ascent is on the western side. The platform is 3 feet high.
1 Kotri Milestone (On road from Kotri to Sehwan.)	67·76	...	Summit of stone.
2 "	66·67	...	Summit of stone.
3 "	66·54	...	Summit of stone.
4 "	69·00	...	Summit of stone.
5 "	70·63	...	Summit of stone.
6 "	71·29	...	Summit of stone.
7 "	67·14	...	Summit of stone.
8 "	72·05	...	Summit of stone.
9 "	71·71	...	Summit of stone.
10 "	72·67	...	Summit of stone.
11 "	76·03	...	Summit of stone.
12 "	76·24	...	Summit of stone.

Sind from Manora Harbor to Kasmore.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
G. T. S. Bench Mark, 12 miles from Kotri ...	72·56	...	The B. M. is buried in a mound, distant 189 feet, and bearing 326° from 12 Kotri milestone. It is buried about 1 foot below ground level, and covered with a mound of earth.
13 Kotri Milestone (On road from Kotri to Sehwan.)	71·00	...	Summit of stone.
14 " "	73·35		
15 " "	74·09		
16 " "	74·81		
17 " "	74·35		
18 " "	75·53		
21 " "	79·92		
22 " "	78·74		
23 " "	79·77		
24 " "	80·86		
25 " "	81·99		
26 " "	83·16		
59 Sehwan / 27 Kotri "	86·07		
58 Sehwan / 28 Kotri "	87·90		
57 Sehwan / 29 Kotri "	88·02	...	Summit of stone, in the village of Kânote
Canal Bench Mark on Bogdada Canal	87·11	...	B. M. about 9 inches square, on Bogdada Canal, between Milestones 57 Sehwan / 29 Kotri and 56 Sehwan / 30 Kotri, superscribed "B. M. No. 2; 1 Mile." There is another Canal B. M. a few yards from it, without any superscription, consisting of a large block of stone, 14 inches square, and 2·35 feet higher than the former one.
56 Sehwan / 30 Kotri Mile stone. (On road from Kotri to Sehwan.)	87·82	...	Summit of stone.
55 Sehwan / 31 Kotri "	86·88		
54 Sehwan / 32 Kotri "	87·44		
53 Sehwan / 33 Kotri "	87·61		

Sind from Manora Harbour to Kasmore.

Names of Stations.		Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
52 Sehwan, 34 Kotri, Mile-stone	On road from Kotri to Sehwan.	88·69	...	Summit of stone.
51 Sehwan, 35 Kotri, "	On road from Kotri to Sehwan.	87·16	...	Summit of stone.
50 Sehwan, 36 Kotri, "	On road from Kotri to Sehwan.	89·28	...	Summit of stone.
49 Sehwan, 37 Kotri, "	On road from Kotri to Sehwan.	84·50	...	Summit of stone.
48 Sehwan, 38 Kotri, "	On road from Kotri to Sehwan.	98·58	...	Summit of stone.
47 Sehwan, 39 Kotri, "	On road from Kotri to Sehwan.	94·99	...	Summit of stone.
46 Sehwan, 40 Kotri, "	On road from Kotri to Sehwan.	92·52	...	Summit of stone.
45 Sehwan, 41 Kotri, "	On road from Kotri to Sehwan.	94·52	...	Summit of stone.
G. T. S. Bench Mark. Manjunda	...	88·18	...	Sunk in north-west corner of compound of Manjunda Dhurrumsala, about 6 feet from the two adjacent walls, and 2·9 feet below the level of the ground. A mound of earth is piled over it to indicate the spot.
44 Sehwan, 42 Kotri, Mile-stone.	On road from Kotri to Sehwan.	95·14	...	Summit of stone.
43 Sehwan, 43 Kotri, "	On road from Kotri to Sehwan.	95·14	...	Summit of stone.
42 Sehwan, 44 Kotri, "	On road from Kotri to Sehwan.	97·31	...	Summit of stone.
41 Sehwan, 45 Kotri, "	On road from Kotri to Sehwan.	99·73	...	Summit of stone.
40 Sehwan, 46 Kotri, "	On road from Kotri to Sehwan.	99·90	...	Summit of stone.
39 Sehwan, 47 Kotri..., "	On road from Kotri to Sehwan.	101·18	...	Summit of stone.
38 Sehwan, 48 Kotri..., "	On road from Kotri to Sehwan.	101·10	...	Summit of stone.
37 Sehwan, 49 Kotri..., "	On road from Kotri to Sehwan.	101·46	...	Summit of stone.
36 Sehwan, 50 Kotri..., "	On road from Kotri to Sehwan.	100·69	...	Summit of stone.
35 Sehwan, 51 Kotri..., "	On road from Kotri to Sehwan.	102·58	...	Summit of stone.

Sind from Manora Harbor to Kasmore.

Names of Stations.			Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Canal Bench Mark on Karowah Canal ...			105·47	...	On summit of north bank of Karowah Canal, engraved " B. M. No. 1." Situated 203 feet east of road.
34 Sehwan } 52 Kotri... }	Mile-stone.	On road from Kotri to Sehwan.	103·21	...	Summit of stone.
33 Sehwan } 53 Kotri... }	"		108·02	...	Summit of stone opposite village of Sun.
32 Sehwan } 54 Kotri... }	"		109·67		
31 Sehwan } 55 Kotri ... }	"		104·16		
30 Sehwan } 56 Kotri... }	"		101·98		
29 Sehwan } 57 Kotri... }	"		105·26		
28 Sehwan } 58 Kotri... }	"		106·14		
27 Sehwan } 59 Kotri... }	"		105·87	...	Summit of stone.
26 Sehwan } 60 Kotri... }	"		105·79		
25 Sehwan } 61 Kotri... }	"		107·51		
24 Sehwan } 62 Kotri... }	"		107·54		
23 Sehwan } 63 Kotri... }	"		109·22		
22 Sehwan } 64 Kotri... }	"		109·32	...	Summit of stone in middle of village of Amri.
21 Sehwan } 65 Kotri... }	"		115·51		
20 Sehwan } 66 Kotri... }	"		110·16		
19 Sehwan } 67 Kotri... }	"		112·51		
18 Sehwan } 68 Kotri... }	"		110·01	...	Summit of stone.
17 Sehwan } 69 Kotri... }	"		103·83		
16 Sehwan } 70 Kotri... }	"		108·98		

Sind from Manora Harbor to Kasmore.

Names of Stations.		Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
15 Sehwan / 71 Kotri... } Mile-stone.	On road from Kotri to Sehwan.	110·68	...	Summit of stone.
14 Sehwan / 72 Kotri... } "		111·52		
13 Sehwan / 73 Kotri... } "		110·98		
12 Sehwan / 74 Kotri... } "		114·16		
11 Sehwan / 75 Kotri... } "		108·15		
10 Sehwan / 76 Kotri... } "		110·88		
9 Sehwan / 77 Kotri... } "		112·61		
8 Sehwan / 78 Kotri... } "		114·55		
Sehwan		119·21	...	Summit of milestone near Mooktiarkari, 24 Dadoo. 87 Kotri
G. T. S Bench Mark, Sehwan		116·92	...	Sunk in mound in front of South Gate of Sehwan Jail, near the Mooktiarkari, at a distance of 46 feet. Summit of B. M. 1·8 feet below surface of mound.
Dumbar H. S. ... Lat. 25° 43′ 3″. Long. 67° 33′ 22″.		...	2,202·7	*Upper Markstone.*—Situated about three-fourths of a mile to the west of the highest point of the hill Dumbar, and near the large village of Tong. It is in the Karachi Collectorate.
Andar H. S. ... ... Lat. 26° 1′ 22″. Long. 67° 14′ 38″.			4,042·2	*Upper Markstone.*—In the Khelat territory, about five miles south-west from the village of Omed Ali, Chief of the Chootta tribe. The ascent is from the eastern side.
Tikka H. S. ... ... Lat. 26° 3′ 1″. Long. 67° 32′ 5″.			3,662·3	*Upper Markstone.*—Situated on a point on the Khirthal range, in the Karachi Collectorate, Zillah Sehwastan, about one mile south-east of the southernmost boundary pillar, on a continuation of the same hill. The platform is 3 feet high.

Sind from Manora Harbor to Kasmore.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Bhit H. S. ... ... Lat. 26° 21′ 9″. Long. 67° 28′ 36″.	...	2,790·0	*Upper Markstone.*—Is situated on a hill of the same name, which projects from the Khirthal range towards the north, and is separated from it by a narrow cleft. The ascent is from the eastern side. The platform is 4 feet high.
Sulimani H. S. ... Lat. 26° 28′ 4″. Long. 67° 15′ 13″.	...	3,472 9	*Upper Markstone.*—Is situated on the most north-easterly rise of a hill called Sham on the Khirthal range. The Sulimani Hill is at a distance of four miles towards Tikka H. S., and is on the same range. The platform is 3 feet high.
Goolaro Bench Mark ...	114·00	...	The village Goolaro ki Busti, where the B. M. is deposited, is about 1,200 yards south of Soopur (Tuppidari), on the west bank of the Nara. It consists of only four or five houses on two mounds; there is a third mound to the south of the others, on which the villagers stack their bhoosa. The B. M. is buried at the north-west corner of this mound, 4½ feet below the surface. By the side of the B. M. is a pole projecting 3 or 4 feet out of the ground, to indicate its position.
Mir Khan Tower Station... Lat. 26° 36′ 21″. Long. 67° 31′ 7″.	183·95	...	To Markstone on summit of tower, which is situated on one of two small rocky hills nearly due west from Gowar Khan's tomb. The westernmost of some extensive chains of low hills run between Mir Khan T. S. and Gowar Khan's tomb. Chinni and Johi are about equally distant from the station, which is in the Kardarate of Johi in the Karachi Collectorate.
Lali H. S. ... Lat. 26° 41′ 40″. Long. 67° 18′ 13″.	...	1,509·2	*Upper Markstone.*—It is situated on summit of a hill of the same name, which lies between the flat plain and the Changa Dang range. It is approached from Bukkur ka Got, which is about seven miles distant, and is in the Kukkur Kardarate of the Shikarpoor Collectorate. The platform is 3 feet high.

Sind from Manora Harbor to Kasmore.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Hairo T. S. ... Lat. 26° 49′ 47″. Long. 67° 30′ 37″.	202·92	...	*Ground level markstone,* which is 29·42 feet below surface of pillar. The station is situated about half mile west of the village of Hairo ka Shahar, and is in the Jooee Kardarate of the Karachi Collectorate.
Chathe H. S. ... Lat. 26° 55′ 2″. Long. 67° 18′ 8″.	...	1,899·7	*Upper Markstone.*—It is situated on a peak of the same name between the high Khirthal range, bounding Sind and the low hills skirting the plain, about equidistant from both, and north of the Gaj River. From the direction of Hairo the approach is by Kasba in the Kukkur Kardarate of the Shikarpoor Collectorate. The village of Rajadera is towards Mir ka Kuba; in both cases the road lies in the bed of the Gaj. The platform is 3 feet high.
Mir ka Kuba T. S. ... Lat. 27° 0′ 4″. Long. 67° 32′ 26″.	219·16	...	*Upper Markstone.*—Is situated on a sand hill close to and north-west of a number of tombs of the Kalhora Dynasty of Amirs. It is in the Mehar Kardarate of the Shikarpoor Collectorate.
Khurbi H. S. ... Lat 27° 4′ 27″. Long. 67° 22′ 29″.	...	1,191·3	*Upper Markstone.*—Is situated on a peak of the lowest range of hills bordering the plains of the same name. Raja ka Khu is about three miles nearly due west from the station.
Sabar Khan T. S. ... Lat. 27° 8′ 41″. Long. 67° 36′ 50″.	158·40	...	*Upper Markstone.*—Is situated a slight distance to the east of the Frontier Road, in Talooka Kukkur, about two miles to south south-west of village Kumber, and three and a half from Mado.
Mojahar H. S. ... Lat. 27° 15′ 34″. Long. 67° 29′ 40″.	...	546·7	*Upper Markstone.*—Is situated on a range of hills running nearly east and west, and forming the southern limits of a basin which extends as far as Gudria Pir. The hills are table-topped, and the range is the most southerly of those having this direction. The platform is 3 feet high.

Sind from Manora Harbor to Kasmore.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Maru Pir T. S. ... Lat. 27° 18′ 42″. Long. 67° 40′ 58″.	174·18	...	*Upper Markstone.*—The station is situated on a mound, on which, about 50 yards to the north-east, is the tomb of Maru Pir. It is in the Mehur District of the Shikarpoor Collectorate. The village of Faridabad is in the direction of Sabar Khan T. S. The tower is about 21 feet high.
Gāndpahar H. S. ... Lat. 27° 25′ 1″. Long. 67° 33′ 11″.	...	723·5	*Upper Markstone.*—It is situated on a hill of the same name, which runs in a direction parallel to the boundary range, and is the first of any consequence from the plains. It is in the Mehar District.
Kharko H S. ... Lat. 27° 35′ 15″. Long. 67° 35′ 40″.	...	647·0	*Upper Markstone.*—Is situated on a hill of the same name, well known in the neighbourhood, and not easily mistaken from its peculiarly cleft appearance. It is in the Jaghir of the Chandia Chief, Ghaibi Khan. The hill rises abruptly from the plain, and is a mere ridge where the station is situated, (to the north of the cleft,) but further to the north, a parallel range is connected with it. The platform is 8 feet high.
Karohar T. S. ... Lat. 27° 30′ 25″. Long. 67° 44′ 27″.	183·21	...	*Upper Markstone.*—Is situated near the village of Karohar, which is in the Tuppeh of Warah, Kardarate of Nasirabad, and Collectorate of Shikarpoor. The tower is built on a high mound, in an open plain, above which the surface of the tower is 47·6 feet; the tower itself being about 18 feet high.
Gazi Kohawar T. S. ... Lat. 27° 21′ 50″. Long. 67° 50′ 46″.	...	159·5	*Upper Markstone.*—Is situated immediately to the north of the village of that name; it is in the Tuppeh of Gazi Kohāwar, Kardarate of Nasirabad, and Collectorate of Shikarpoor. The tower is 25 feet high.

Sind from Manora Harbor to Kasmore.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Goghari T. S. ... Lat. 27° 29′ 17″. Long. 68° 4′ 8″.	...	183·7	*Upper Markstone.*—Is situated on a mound about 0·15 miles north-east of the village of the same name, in the Tuppeh of Khairpur, Kardarate of Larkhana, and Zillah of Shikarpoor. Height of tower 20 feet 6¾ inches above the lower markstone.
Theba T. S. ... Lat. 27° 29′ 16″. Long. 67° 56′ 37″.	...	171·8	*Upper Markstone.*—Is situated about one-quarter mile south-east of the small village of that name, and close to the paka well belonging to it, on the boundary between the lands of Theba and Lalu Raong, which is about a mile to the north. The station is in the Tuppeh of Wara, Kardarate of Nasirabad, and Larkhana Division of Zillah Shikarpoor. The tower is 31 feet high.
Sojra T. S. ... Lat. 27° 37′ 50″. Long. 67° 50′ 19″.	173·49	...	*Upper Markstone.*—Is situated on a mound of that name in the Jaghir of Chandia Chief, Ghaibi Khan. Is in a plain covered with jungle, the nearest village is Burha, about three-fourths of a mile to the south-east, consisting merely of a few huts. There is a large village, Dost Ali, about 5·2 miles to the east north-east, and Ghaibi Dera as far in the opposite direction. The surface of tower is 35·3 feet above the neighbouring plain, height of tower being 25 feet.
Bairam T. S. ... Lat. 27° 45′ 1″. Long. 67° 56′ 18″.	...	186·5	*Upper Markstone.*—Is situated on a mound covered with groves, about three miles east of the village of Bairam, and as far from that of Sangi. The station is in the Karo Tuppeh of the Kumbur Kardarate. The surface of the tower is about 41 feet above the plain, its height being 20 feet.

Sind from Manora Harbor to Kasmore.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Lakha T. S. ... Lat. 27° 37′ 14″. Long. 68° 1′ 21″.	154·18	...	*Ground Level Markstone.*—Is situated about 200 yards to the north of the small village of the same name, 12 miles to the north-west of Chejra, and about two miles north of Kumbur. Is in the district of the Kardar of Kumbur and in the Larkhana Division of the Zillah of Shikarpoor. The tower is 30 feet 7 inches high above the Markstone, which is elevated 2 feet above the neighbouring country.
Jhukur T. S. ... Lat. 27° 33′ 34″. Long. 68° 10′ 4″.	...	220·4	*Upper Surface Markstone.*—Is situated on a high and large mound about one and a half mile south of the road from Larkhana to Kumbur, and the same distance north of that from Larkhana to Khairpur. The village of Mitha Dera is at the foot of the mound. Is in the Tuppeh of Khairpur, Kardarate of Larkhana, and Zillah of Shikarpoor. The platform is 4 feet high, its surface is 66 feet above the neighbouring plain.
Chandia Khan T. S. ... Lat. 27° 42′ 16″. Long. 68° 7′ 59″.	155·32	...	*Ground Level Markstone.*—Is situated about 300 yards to the south-west of the small village of Chandia Khan Drib. Is in the Tuppeh of Mahin and in the district of the Kardar of Kumbur. The tower is 30 feet high.
Toonia T. S. ... Lat. 27° 30′ 51″. Long. 68° 18′ 56″.	...	198·7	*Upper Surface of Pillar.*—Is situated about 100 yards to the south-east of the small village of Toonia, about five miles south-east of Larkhana, and west of the village of Katha, on the land of which the tower is erected. The Indus flows about a mile to the south. The station is in the Larkhana Kardary, District Shikarpoor, Upper Sind. The tower is 30·2 feet high above the ground level markstone.

Sind from Manora Harbor to Kasmore.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Dhamraha T. S. ... Lat. 27° 39′ 9″. Long. 68° 18′ 4″.	...	204·0	*Upper Surface of Pillar.*—Is situated about half a mile south-east by east of the small village Dhamraha. Is in the Larkhana Kardary, District Shikarpoor. The tower is 40 feet above ground floor markstone.
Jalbani T. S. ... Lat. 27° 49′ 5″. Long. 68° 16′ 26″.	165·74	...	*Ground Level Markstone.*—Is situated about 300 yards to the south of the small village Mohamad Khan, inhabited by a sect called Jalbanees, originally from Beeloochistan. Is in the Ratti Dera Kardary, District Shikarpoor. The tower is 40·36 feet above ground level markstone.
Mangi T. S. ... Lat. 27° 45′ 25″. Long. 68° 25′ 36″.	...	205·5	*Upper Surface of Pillar.*—Is situated about 300 yards south-east of the village of Mangi, in the Derkhan Kardary, District Shikarpoor. Surface of tower is 31·0 feet from markstone in ground floor.
Hosein Khan T. S. ... Lat. 27° 44′ 36″. Long. 68° 34′ 45″.	...	220·7	*Upper Surface Markstone.*—Is situated on a plain covered with low jungle about half a mile east of the village of the same name, in the Derkhan Kardary, District Shikarpoor. The tower is about 35 feet above the surrounding country.
Bhoora T. S. ... Lat. 27° 38′ 11″. Long. 68° 27′ 10″.	...	205·0	*Upper Surface of Pillar.*—Is situated in the midst of a grove of Bheir (Zizyphus Vulgaris) trees adjoining the south side of the deserted village of Bhoorra. The Nara Canal runs about 100 yards to the south. The station is in the Ratti Dera Kardary, District Shikarpoor. The tower is 30·2 feet above ground markstone.

Sind from Manora Harbor to Kasmore.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Yosoof P. S. ... Lat. 27° 51′ 9″. Long. 68° 28′ 42″.	215·29	...	*Upper Surface Markstone* of platform, which is 8·71 feet high. It is situated on the ruins of an ancient village about 25 feet above the surrounding country. The village of Wasil is half a mile south-west by west, Udha, one-quarter mile south, Fakir-ka-gote, one mile north, and the small mud Fort of Yosoof about half a mile north-east. The station is in the Derkhan Kardary, District Shikarpoor.
Salar T. S. Lat. 27° 58′ 46″. Long. 68° 31′ 8″.	...	205·1	*Upper Surface of Pillar.*—It is situated in the midst of an extremely wooded tract; the nearest habitation is the hamlet of Salar, about one and a half miles to north-west. The Fort of Yaseen-ka-gari lies about three or four miles south of the station, which is in the Derkhan Kardary, District Shikarpoor. The tower is 25·4 feet above markstone in ground floor.
Mari T. S. Lat. 27° 55′ 7″. Long. 63° 38′ 11″.	225 63	...	*Upper Surface Markstone.*—It is situated on the side of a canal about three-fourths of a mile south-west of village of Mari, and about three miles south of the town of Shikarpoor. The station is in the Kardary and District of Shikarpoor. The tower is about 36 feet above the neighbouring country.
Lakhi T. S. Lat. 27° 51′ 8″. Long. 68° 44′ 24″.	...	234·5	*Upper Surface Markstone.*—It is situated on a small mound about 10 feet above the adjacent ground. The village of Lakhi is about 100 yards to the south, and the trunk road from Sukkur to Shikarpoor runs about 100 yards to the north. The station is in the Sukkur Kardary, District Shikarpoor. The tower is 27·6 feet high.

Sind from Manora Harbor to Kasmore.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Adushah T. S. ... Lat. 27° 52′ 45″. Long. 68° 55′ 34″.	...	233·7	*Upper Surface of Pillar.*—It is situated on one of the bastions of a small dilapidated mud redoubt, about half a mile south-west of village Adushah, in the Sukkur Kardary, District Shikarpoor. The tower is 20·92 feet above markstone in ground floor.
Hatidara T. S. ... Lat. 27° 59′ 2″. Long. 68° 47′ 23″.	234·75	...	*Upper Surface Markstone.*—It is situated on a sand hill about 15 or 16 feet above the level of the surrounding land. The nearest village is Khanpur, about one and a quarter miles to the north-west. The station is in the Kardary and District of Shikarpoor. The tower is 19·3 feet high.
Sultan-ka-gote T. S. ... Lat. 28° 4′ 9″. Long. 68° 38′ 59″.	...	212·8	*Upper Surface of Pillar.*—It is situated about 0·6 of a mile east of the village of the same name, in the Kardary and District of Shikarpoor. The tower is 25·0 feet above markstone in ground floor.
Kalhora T. S ... Lat. 28° 8′ 30″. Long. 68° 49′ 44″.	...	227·9	*Upper Surface of Pillar.*—It is situated on the banks of a large canal. The village of Kalhora is two and a half miles to the south south-west, Ahmad Bhoorra two and a half miles west, and the large village of Mirpur about four miles to the north-west. The station is in the Mirpur Kardary, District of Jacobabad. The tower is 27·30 feet above ground markstone.
Jangal Pahora T. S. ... Lat. 28° 2′ 13″. Long. 68° 57′ 30″.	203·48	...	*Ground Level Markstone.*—It is situated on a small patch of cleared ground, the country around which is covered with low dense jungle. The hamlet of Jangal Pahora is about a mile north-east by east of the station, which is in the Sukkur Kardary, District Shikarpoor. The tower is 25·21 feet above the ground markstone.

Sind from Manora Harbor to Kasmore.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Hajichachar T. S. ... Lat. 27° 56′ 5″. Long. 69° 6′ 34″.	...	235·8	*Upper Surface of Pillar.*—It is situated in an open plot of level ground, in the midst of an extensive forest on the left or east bank of the Indus, which flows about one and a half miles from the station, which is in the Rori Kardary, District Shikarpoor. The village of Hajichachar is about four miles to the south. The tower is 25·05 feet above ground markstone.
Wasand T. S. ... Lat. 28° 6′ 14″. Long. 69° 8′ 16″.	...	239·8	*Upper Surface of Pillar.*—It is adjacent to the hamlet of Wasand, and about two and a half miles south-east of the large village of Gaospoor. The station is in the Mirpur Kardary, District of Jacobabad. The tower is 25·17 feet above the markstone in the ground floor.
Littan T. S. ... Lat. 28° 11′ 23″ Long. 69° 0′ 47″.	213·32	...	*Ground Level Markstone.*—It is situated in a wild and wooded tract of country, and a great distance from any regular established village, except the hamlets of a few roving Beloochees. The hamlet of Littan is about two and a half miles to the south south-west. The station is in the Shergarh Kardary, District of Jacobabad. The tower is 29·71 feet above ground level markstone.
Bhanner T. S. ... Lat. 28° 8′ 55″. Long. 69° 19′ 39″.	...	255·9	*Upper Surface of Pillar.*—It is situated about 150 yards to the north of the village of Bhanner, and is in the Mirpur Kardary, District of Jacobabad. The tower is 31·00 feet above the markstone in ground floor.
Kundkot T. S. ... Lat. 28° 14′ 43″. Long. 69° 13′ 11″.	231·25	...	*Ground Level Markstone.*—It is situated on a slight swell of ground about 100 yards to the north of the village of Kundkot, in the Mirpur Kardary, District Jacobabad. The tower is 35·63 feet above the ground level markstone.

Sind from Manora Harbor to Kasmore.

Names of Stations.	Height above Mean Sea Level.		Remarks and Description of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Cheel T. S. ... Lat. 28° 20′ 58″. Long. 69° 6′ 12″.	...	249·6	*Upper Surface of Pillar.*—It is situated on a slight swell of ground on an extensive plain, and far removed from any habitation. The nearest village is Tangwani, about five miles to the south-west. The locality is known as Cheel kua, from two wells sunk by Beloochees, and is in the Mirpur Kardary, District of Jacobabad. The tower is 30·31 feet above the ground level markstone.
Bela T. S. ... Lat. 28° 23′ 31″. Long. 69° 16′ 11″.	...	257·8	*Upper Surface of Pillar.*—It is situated on an extensive plain, and derives its name from the locality called Bela by the Beloochees. There is no habitation for several miles round the station, which is in the Mirpur Kardary, District of Jacobabad. The tower is 30·61 feet above markstone in ground floor.
Khai T. S. ... Lat. 28° 16′ 57″. Long. 69° 22′ 34″.	...	263·6	*Upper Surface of Pillar.*—It is situated in the midst of a very wooded tract of country. The village of Khai is about five miles south. The tower is 30·27 feet above the ground level markstone, and is in the Kasmore Kardary, District of Jacobabad.
Kutabuddin T. S. ... Lat. 28° 8′ 26″. Long. 69° 29′ 57″.	...	265·9	*Upper Surface of Pillar.*—It is situated on the left bank of the Indus, about one-quarter mile north of the village of the same name, in the Gotki Kardary, Rori Collectorate, District Shikarpoor. The village of Kotla lies about two and a half miles east, and Tandra about three miles north-east. The tower is 29·63 feet above lower markstone.
Bench Mark on road from Shikarpoor to Larkhana.	191·72	...	Summit of stone B. M., which is about 6 feet long and sunk 5 feet in ground, 20 feet north of 2nd milestone from Shikarpoor, and 37th from Larkhana. The B. M. was placed here in order to be connected with the leveling operations of Sind Canal Department.

Sind from Manora Harbor to Kasmore.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Shikarpoor Kutcherry ...	193·89	...	Iron plug driven horizontally into north wall of Shikarpoor Kutcherry, on level of plinth, at a distance of 53 feet from north-east angle towards Major Stewart's house.
Koombri B. M. ..	233·44	..	Bench Mark No. I. of Canal line of levels from Kasmore to Jalalabad. It is situated about 250 yards west by north from Koombri spiral tower.
Doodur-ka-kote. Canal Bench Mark.	240·76	...	B. M. No. V. of Captain Soady's levels from Kasmore to Jacobabad, in front of ruined Ghurri of Doodur-ka-kote, on road to Kasmore.
Raoti T. S. ... Lat. 28° 10′ 50″. Long. 69° 39′ 0″.	...	267·2	*Upper Surface of Pillar.*—It is situated on the left bank of the Indus to the north-east of the village of Raoti, in the Oobaora Kardary, Rori Collectorate, District of Shikarpoor. The tower is 29·75 feet above the markstone in the ground floor.
Leni T. S. ... Lat. 28° 25′ 8″. Long. 69° 26′ 21″.	...	273·0	*Upper Surface of Pillar.*—It is situated on an extensive plain far removed from habitation. The nearest village is Kimbi or Koombi, about five miles to the south south-west. The tower is 30·00 feet high above the markstone in the ground floor, and is in the Kasmore Kardary, Jacobabad District, Upper Sind.
Mulla Amad T. S. ... Lat. 28° 18′ 27″. Long. 69° 32′ 40″.		271·8	*Upper Surface of Pillar.*—It is situated on the lands appertaining to the small village of Mulla Amad, about 250 yards to the south. It is in the Kasmore Kardary, Jacobabad District. The tower is 26·82 feet above ground markstone.
Kasmore T. S. ... Lat. 28° 26′ 29″. Long. 69° 36′ 24″.	245·56	...	*Ground Level Markstone.*—It is situated about half a mile west of the small town of Kasmore. The tower is 29·44 feet above the ground level markstone. It is in the Kasmore Kardary, District Jacobabad. Upper Sind.

Sind from Manora Harbor to Kasmore.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Kasmore Bench Mark ...	246·66	...	B. M. No. XX. of Canal line of levels to Jacobabad, situated about 200 yards north-east of Sowars' lines at Kasmore.
Lungey-ke-koo Canal B. M.	253·20	...	B. M. No. XVIII. of Captain Soady's Canal line of levels, situated at Lungey-ke-koo, 350 yards south of point where road from New Kasmore to Lungey-ke-koo joins road from old Kasmore to Shawali.

SECTION II.

Dehra Gazi Khan; from Shawali to Towsa.

Leaving Kasmore, the levels follow the main road to Shawali, and thence to Dehra Gazi Khan, viâ Kin, Moorghai, Rajanpoor, and Jampoor, passing midway between Mithan Kote and the Station of Asnee.

The Survey Stations on this Section were not built when the levels were taken, but were subsequently connected with the Bench Marks by trigonometrical observations.

The line of levels lies entirely on the west bank of the Indus from Karachi to Dehra Gazi Khan, and then crosses to the east bank, near the ferry on the road to Mooltan.

Dehra Gazi Khan ; from Shawali to Towsa.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Shawali T. S. ... Lat. 28° 27′ 24″. Long. 69° 47′ 4″.	...	291·2	*Upper Surface of Pillar.*—It is situated about 20 yards from the right bank of the Indus and 0·8 of a mile north north-east of the village of Shawali. It is in the Sub-Division of Mithan Kote, District Dehra Gazi Khan. The tower is 29·86 feet above the markstone in the ground floor.
Shawali Canal B. M. ... Lat. 28° 27′ 38″. Long. 69° 46′ 6″.	264·66	...	B. M. No. XXXI. of Captain Soady's Canal line of levels in plains near Shawali.
Nazir da posht H. S. ... Lat. 28° 33′ 59″. Long. 69° 41′ 45″.	...	397·0	*Upper Surface Markstone.*—It is situated on the highest point of an irregular mass of low limestone hills, far from any habitation. The nearest places being Shawali and Kasmore. This tract of country belongs to Dost Ali, the Chief of the Mazari tribe, who resides at Rojhan in the Sub-Division of Mithan Kote, District Dehra Gazi Khan. The upper markstone is 4½ feet above the lower one.
Miani T. S. ... Lat. 28° 34′ 15″. ... Long. 69° 53′ 14″. ...	...	300·5	*Upper Surface of Pillar.*—It is situated on a cleared plot of ground in the midst of a dense forest, about 1½ miles from the hamlet of Miani to the north-east. It is in the Sub-Division of Mithan Kote, District Dehra Gazi Khan. The tower is 28·00 feet above ground level markstone.
Kin Bench Mark ... Lat. 28° 37′ 40″. Long. 69° 55′ 50″.	270·82	...	B. M. sunk into wall of ruined enclosure of post at Kin, 9 feet from gateway of enclosure, and 95 feet from the main wall. The surface of stone sunk about 1 foot below surface of ruin, and covered over.

Dehra Gazi Khan ; from Shawali to Towsa.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Riwari T. S. ... Lat. 28° 38′ 7″. Long. 70° 1′ 42″.	...	305·4	*Upper Surface of Pillar.*—It is situated in the midst of an extensive grass jungle, about one-quarter mile east of the village of Riwari. The town of Rojhan is about four miles to the north-north-east. The tower is 30·27 feet above the markstone in the ground floor. In the Sub-division of Mithan Kot, District Dehra Gazi Khan.
Madadalari T. S. ... Lat. 28° 42′ 12″. Long. 69° 54′ 31″.	...	304·2	*Upper Surface of Pillar.*—It is situated on level ground surrounded with jungle, and very remote from habitation. The nearest place is Rojhan. The outpost of Bandowali is about four miles north-west of the station, which is in the Sub-division of Mithan Kot, District Dehra Gazi Khan. The tower is 27·00 feet above the markstone in ground floor.
Mirapoor T. S. ... Lat. 28° 45′ 18″. Long. 70° 3′ 10″.	...	309·4	*Upper Surface of Pillar.*—It is situated about 300 yards to the west of the Post, on the land appertaining to the village of Mirapoor, about three miles to the south-south-east. It is in the Sub-division of Mithan Kot, District Dehra Gazi Khan. The tower is 25·00 feet above markstone in ground floor.
Badli Bench Mark. ... Lat. 28° 45′ 59″. Long. 70° 7′ 19″.	276·77	...	B. M. buried about eight yards north of road, near the angle it makes at the village of Badli. It bears 359° and is distant about 530 yards from the northern-most tower in the village. Three mounds are erected round the B. M. the head of which is 1 foot below ground level.
Chakerwali T. S. ... Lat. 28° 41′ 4″. Long. 70° 11′ 29″.	...	309·5	*Upper Surface of Pillar.*—It is situated on an extensive island of the Indus, and is distant about three and a half miles south-east by east from village of Chakerwali. It is in the Sub-division of Mithan Kot, District Dehra Gazi Khan. The tower stands on a basement 5·38 feet high, and is raised to a height of 21·69 feet above the markstone in the floor of the basement.

Dehra Gazi Khan; from Shawali to Towsa.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Kaheeri T. S. Lat. 28° 49′ 22″. Long. 70° 13′ 42″. ...	...	323·5	*Upper Surface of Pillar.*—It is situated 0·3 of a mile south-south-west of the small village of Kaheeri. The town of Omerkote is about three miles to the west. The tower is 31·00 feet above the markstone in ground floor. In the Sub-division of Mithan Kot, District Dehra Gazi Khan.
Lalgoshi T. S. Lat. 28° 52′ 59″. Long. 70° 5′ 22″. ...	...	342·3	*Upper Surface of Pillar.*—It is situated on a mound in an extensive plain. The nearest place is Omerkote, about six miles to the east. The tower is 22·92 feet above the markstone in the ground floor. In the Sub-division of Mithan Kot, District Dehra Gazi Khan.
Moorghai B. M. Lat. 28° 55′ 9″. Long. 70° 18′ 25″. ...	293·66	...	B. M. sunk in Moorghai, on high ground between road and canal, near sharp angle in road, (where its direction changes from 260° to 210°,) and close to kacha bridge over canal. The stone is sunk 1 foot below surface of ground, and is surrounded with three mounds and a ditch.
Hamidpoor T. S. Lat. 28° 57′ 3″. Long. 70° 14′ 7″. ...	...	332·0	*Upper Surface of Pillar.*—It is situated in the midst of an extensive forest, about 100 yards west of the military outpost of Hamidpoor. There is no habitation near the station. The nearest place is Moorghai, about four miles east. The Cantonment of Asnee is about five miles north-north-east. The tower is 30·00 feet above markstone in ground floor. In the Sub-division of Mithan Kot, District Dehra Gazi Khan.

Dehra Gazi Khan; from Shawali to Towsa.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Gola T. S. ... Lat. 28° 53′ 39″. Long. 70° 22′ 51″.	295·08	...	*Ground Level Markstone.*—On the left bank of a branch of the Indus called Kanchani-ka-nalla, and about three-fourths of a mile from right bank of river. The village of Gola is about 0·4 mile to south-south-west, village of Banka about one mile north-north-west, and the town of Mithan Kot about three miles north-east. The tower is 34·79 feet above ground floor markstone. It is in the Sub-division of Mithan Kot, District Dehra Gazi Khan.
Daggo T. S. ... Lat. 29° 1′ 45″. Long. 70° 23′ 36″.	...	346 0	*Upper Surface of Pillar.*—It is situated on a low mound about one and a half miles north-east of the village of Daggo, and about two miles south-east of the village of Nasir Kotlah. The tower is 33·50 feet high above ground floor markstone. It is in the Sub-division of Mithan Kot, District Dehra Gazi Khan.
Goolshera T. S. ... Lat. 29° 5′ 19″. Long. 70° 16′ 9″.	...	339·9	*Upper Surface of Pillar.*—It is situated about five miles south-west of town of Rajunpoor, and about four miles north-north-west of Asnee; and derives its name from the locality called Gulshera-ka-Thool, about two miles to the north-west. The tower is 26·18 feet above ground floor markstone. It is in the Sub-division of Mithan Kot, District Dehra Gazi Khan.
Rajanpoor B. M. ... Lat. 29° 6′ 20″. Long. 70° 21′ 55″.	304·92	...	B. M. is sunk in ground before north of gate of town of Rajunpoor, in line between two large old peepul trees; underneath the east peepul tree stands the Khanghah of Noorshah. The stone is sunk 6 inches below ground level, and is surrounded by three mounds of earth and a ditch.

Dehra Gazi Khan ; from Shawali to Towsa.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Ismail T. S. ... Lat. 29° 11′ 16″. Long. 70° 22′ 27″.	...	350·3	*Upper Surface of Pillar.*—It is situated about 0·2 of a mile south of the village of Ismail, and about four miles west north-west of village of Eesun-ka-kotla. The tower is 32·05 feet above ground floor markstone. It is in the Sub-division of Mithan Kot, District Dehra Gazi Khan.
Gapola T. S. ... Lat. 29° 8′ 18″. Long. 70° 32′ 14″.	...	345·3	*Upper Surface of Pillar.*—It is situated about 0·6 of a mile east of the village of Gapola, and about four miles south-east of village of Shikarpoor. The tower is 31·92 feet high above the mark-stone in the ground floor, and is in the Sub-division of Mithan Kot, District Dehra Gazi Khan.
Gangah T. S. ... ... Lat. 29° 17′ 7″. Long. 70° 30′ 7″.	...	349·0	*Upper Surface of Pillar.*—It is situated about three-fourth of a mile to the south-east of the town of Fazulpoor, Thannah Fazulpoor; Tahsil Mithan Kot, District Dehra Gazi Khan. The tower is 28·16 feet high.
Hajipur T. S ... Lat. 29° 21′ 17″. Long. 70° 22′ 6″.	...	380·2	*Upper Surface of Pillar.*—It is situated about 200 yards south of the town of Hajipur, and about 100 yards east of the domed tomb of Nur Mahomed. It belongs to the Thannah and Tahsil of Dajel, District of Dehra Gazi Khan. The tower is 25·62 feet high.
Fazulpoor B. M. ... Lat. 29° 17′ 49″. Long. 70° 29′ 53″.	321·66	...	B. M. sunk on east side of road, 374 yards from north gate of town of Fazulpoor. The stone is sunk 6 inches below surface of ground, and surrounded by three mounds of earth and a ditch.
Islampur T. S. ... Lat. 29° 26′ 2″. Long. 70° 28′ 55″.	...	368·1	*Upper Surface of Pillar.*—It is situated on the east side of the village of Islampur, about three miles south-west of the village of Bokhara, and about five miles south-west of the town of Mahomedpoor, Thannah Jampur, Tahsil Dajel, District Dehra Gazi Khan. The tower is 25·21 feet high.

Dehra Gazi Khan; from Shawali to Towsa.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Jalwala T. S. ... Lat. 29° 24′ 29″. Long. 70° 37′ 7″.	...	358·5	*Upper Surface of Pillar.*—It is situated about half a mile north-east of the well of the same name; one and three-quarter miles west of the town of Rekh, and about one mile sonth of Baghwalaku, Thannah Fazulpoor, Tahsil Mithan Kot, District Dehra Gazi Khan. The tower is 25·16 feet high.
Mahomedpoor B. M. ... Lat. 29° 28′ 27″. Long. 70° 33′ 2″.	338·04	...	B. M. sunk west of main road, about 330 yards north of the branch from the main road to the encamping ground. The B. M. is sunk about 6 inches below level of ground, and surrounded by three mounds of earth.
Kambar Shah T. S. ... Lat. 29° 32′ 1″. Long. 70° 35′ 59″.	...	364·3	*Upper Surface of Pillar.*—It is situated one-fifth of a mile south-east of the village of the same name, and about three miles south-west of Moghlan Kotla, Thannah Jampoor, Tahsil Dajel, District Dehra Gazi Khan. The tower is 24·58 feet high.
Dajel T. S. ... Lat. 29° 33′ 22″. Long. 70° 25′ 21″.	...	411·6	*Upper Surface Markstone.*—It is situated on the embankment of the tank at Dajel, east of the city, close to a paka Shiwala in course of building. Thannah and Tahsil Dajel, District Dehra Gazi Khan. The upper mark is 32·85 feet above general level of the country.
Jampoor B. M. ... Lat. 29° 38′ 50″. Long. 70° 38′ 5″.	348·65	...	B. M. is sunk 6 inches below ground level on east side of road, 77 yards north of northernmost pillar of encamping ground at Jampoor.
Dalura T. S. ... Lat. 29° 38′ 42″. Long. 70° 35′ 42″.	...	399·1	*Upper Surface of Pillar.*—It is situated on the north-west extremity of a large mound, the site of an ancient city, two and a half miles west of the city of Jampoor, and about half a mile west of the village of Futteh Khan. It belongs to the Thannah of Jampoor, Tahsil of Dajel, District of Dehra Gazi Khan. Summit of tower is 16·08 feet above ground floor markstone.

Dehra Gazi Khan ; from Shawali to Towsa.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Din-ka-Kotla T. S. ... Lat. 29° 37′ 32″. Long. 70° 45′ 51″.	...	380·5	*Upper Surface of Pillar.*—It is situated about one-quarter mile west of the village of Din-ka-Kotla, or Din Shah Kotla, and three-tenths of a mile north-west of Loondi. It is in the Thannah of Chota-ka-Kote, Tahsil and District Dehra Gazi Khan. The tower is 27·33 feet high.
Jhakar T. S. ... Lat. 29° 46′ 40″. Long. 70° 45′ 53″.	...	405·3	*Upper Surface of Pillar.*—It is situated one-tenth of a mile south-west of the small village of the same name, close to the road from Dehra Gazi Khan to Sheroo. It belongs to the Thannah of Chota-Kot, Tahsil and District of Dehra Gazi Khan. The summit of tower is 32 feet above ground floor markstone.
Tobwala T. S. ... Lat. 29° 49′ 46″. Long. 70° 37′ 4″.	...	405·0	*Upper Surface of Pillar,* which is 30·08 feet above ground level markstone. It is situated close to the well of the same name in Thannah Chota-Kot, Tahsil and District Dehra Gazi Khan. The large village of Mana is distant three miles to the east-south-east, Khanpoor three miles to the south, Jham one and a half miles to north ; Saharan-ki-Busti, three-fourths of a mile south-west, and Mochiwala one mile to north.
Choota Kot B. M. ...	372·94	...	Sunk by east side of road to Dehra Gazi Khan, where it takes a bend, about 440 yards north of Choota Kot.
Naharwala T. S. ... Lat. 29° 56′ 21″. Long. 70° 43′ 9″.	...	409·0	*Upper Surface of Pillar,* which is 29·56 feet above markstone in ground floor. It is situated a little to the south of the well of the same name, at a distance of three-tenths of a mile north-east of the village of Aliwala or Ullah-ka-Kot, and about four miles north-east of Choota Kot. It is in the Kotwali, Tahsil, and District of Dehra Gazi Khan.

Dehra Gazi Khan; from Shawali to Towsa.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Bhutewala T. S. ... Lat. 29° 53′ 53″. Long. 70° 52′ 45″.	...	410·8	*Upper Surface of Pillar*, which is 24·29 feet above markstone in ground floor. It is situated close to the well of the same name, three-tenths of a mile south-east of the village of Kahiri, in the Kotwali, Tahsil, and District of Dehra Gazi Khan.
Mian Bara B. M. ...	386·37	...	Sunk 1 foot below ground level, on west side of road, in grave-yard of Mian Bara, near Choohetra well, one and a quarter mile south of the village of Guggoo.
Ilwala T. S. ... Lat. 30° 4′ 6″. Long. 70° 40′ 58″.	...	430·0	*Upper Surface of Pillar*, which is 28·70 feet above ground floor markstone. It is situated close to the well of the same name, on the side of the road leading from Dehra Gazi Khan to Viddore, at a distance of one-quarter mile north-west of the village of Chourutta, in the Thannah of Yaroo, Tahsil and District of Dehra Gazi Khan.
Dorutta T. S. Lat. 30° 2′ 33″. Long. 70° 50′ 20″.	396·68	...	*Ground Level Markstone.*—It is situated about a mile to south-east of the city of Dehra Gazi Khan, close to the small jugi of Dorutta, in the Kotwali, Tahsil, and District of Dehra Gazi Khan. Upper surface of tower is 29·16 feet above markstone in the ground floor.
Dehra Gazi Khan B. M. ...	394·67	...	Imbedded 1 foot below level of ground between the gate and south-west bastion of Treasury, and adjoining the latter, about 120 feet east of masonry flower stand to the south of, and fronting, the Dehra Gazi Khan Kutcherry.
Hotwala T. S. ... Lat. 30° 11′ 29″. Long. 70° 47′ 1″.	...	438·1	*Upper Surface of Pillar*, which is 29·83 feet above ground level markstone. It is situated close to the well of the same name, about half a mile north-east of the town of Pir Adul, in the Thannah of Yaroo, Tahsil and District of Dehra Gazi Khan.

Dehra Gazi Khan ; from Shawali to Towsa.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Guhman T. S. Lat. 30° 20′ 30″. Long. 70° 44′ 49″. ...	...	451·4	*Upper Surface of Pillar,* which is 28·00 feet above markstone in ground floor. It is situated close to the small village generally known as Guhmanwala-ka-kū to distinguish it from the larger village of Guhman, between Loond and Khandikot. The station is about three miles south-west of Kala, and the same distance due south of Rahman. It is in the Thannah of Yaroo, Tahsil and District of Dehra Gazi Khan.
Khandikot T. S. Lat. 30° 27′ 29″. Long. 70° 43′ 48″. ...	.	503·9	*Upper Surface of Pillar.*—It is situated close to the Fort of Khandiwala, belonging to Fazul Ali Khan, of the Loond Beloochees. It is in the Thannah Yaroo, Tahsil and District of Dehra Gazi Khan. The summit of tower is 15·01 feet above markstone in the ground floor.
Gadi T. S. Lat. 30° 34′ 57″. Long. 70° 48′ 4″. ...	...	481·2	*Upper Surface of Pillar.*—It is situated between the villages of Gadi, distant seven-tenths of a mile, and Makwal, distant about three-fourths of a mile. It belongs to the Thannah of Towsa, Tahsil of Sungur, District of Dehra Gazi Khan. The summit of tower is 25·5 feet above ground floor mark.
Towsa T. S. Lat. 30° 41′ 52″. Long. 70° 41′ 28″. ...	...	593·0	*Upper Surface of Pillar.*—It is situated at the south-eastern extremity of the town of Towsa. It belongs to the Thannah of Towsa, Tahsil of Sungur, District of Dehra Gazi Khan. The upper surface of tower is 21 feet above markstone in ground floor.
Langawala T. S. Lat. 30° 51′ 28″. Long. 70° 45′ 46″. ..	...	499·5	*Upper Surface of Pillar.*—It is situated about 200 yards south of the small village of the same name, and one and a half mile south-west of Nusseer-ka-busti. It is in the Thannah of Towsa, Tahsil of Sungur, District of Dehra Gazi Khan. The upper surface of tower is 24·38 feet above markstone in the ground floor.

SECTION III.

Moozuffergurh; from Thul Megraj to Dára Din Panah.

After crossing the Indus, near Dehra Gazi Khan, the line of levels traverses the eastern flank of the Indus triangulation, through the Moozuffergurh District, to the Station of Dára Din Panah.

Moozuffergurh ; from Thul Megraj T. S. to Dára Din Panah P. S.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Thul Megraj T. S. ... Lat. 29° 15′ 37″. Long. 70° 40′ 46″.	...	348·6	*Upper Surface of Pillar.*—It is situated on the left bank of the Indus; on the north side of and close to the village of the same name. It belongs to the Thannah and Tahsil of Seetpoor, District Moozuffergurh. The summit of tower is 30·15 feet above markstone in ground floor.
Abrin T. S. ... Lat. 29° 43′ 11″. Long. 70° 54′ 41″.	...	398·1	*Upper Surface of Pillar.*—It is situated about one-fifth of a mile south-east of the small village of Shekh Mahomed Bux Abrin; about 200 yards east of the small village of Doorgahiwala, and about two miles south of the larger village of Khujjur. It is in the Thannah of Kinjar, Tahsil and District of Moozuffergurh. Summit of tower is 30·73 feet above markstone in ground floor.
Mara T. S. ... Lat. 30° 1′ 42″. Long. 70° 59′ 44″.	...	443·7	*Upper Surface of Pillar.*—It is situated on the left bank of the Indus, on a sand hill, rather less than one-quarter mile north of the small village of Mara, close to the road from Goojrat to Kinjur, and about three miles south of village of Koreishee. It belongs to the Thannah of Kinjur, Tahsil and District of Moozuffergurh. The summit of tower is 20·6 feet above markstone in ground floor.
Khemwala T. S. ... Lat. 30° 9′ 46″ Long. 70° 59′ 14″.	409·63	...	*Ground Level Markstone.*—It is situated close to the well of the same name, about six-tenths of a mile west of the village of Goojrat, in Thannah of Mahmud Kot, Tahsil Adu Kot, District Moozuffergurh. The summit of tower is 27·35 feet above ground level markstone.

Moozuffergurh; from Thul Megraj to Dára Din Panah.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Mohana T. S. ... Lat. 30° 17′ 31″. Long. 70° 56′ 35″.	...	450·3	*Upper Surface of Pillar.*—It is situated in the midst of the small village of Mohana, about three miles west of Tatta Gumani, in Thannah of Sanawa, Tahsil of Adu Kot, District of Moozuffergurh. The summit of tower is 26·14 feet above ground level markstone.
Mahiwala T. S. ... Lat. 30° 15′ 47″. Long. 71° 5′ 0″.	428·67	...	*Ground Level Markstone.*—It is situated on a sand ridge separating the two small jugis of Mahiwala and Mahowala, distant about one-quarter mile from each, in the boundary of the village of Bhukhi. It is in Thannah of Sanawa, Tahsil Adu Kot, District Moozuffergurh. The summit of tower is 25·70 feet above ground level mark.
Abaswala T. S. ... Lat. 30° 24′ 18″. Long. 71° 5′ 4″.	449·03	...	*Ground Level Markstone.*—It is situated on a high sand hill, four-tenths of a mile south-east of the well of the same name, and about five miles south-south-east of the city of Adu Kot. It is in Thannah of Sanawa, Tahsil of Adu Kot, District of Moozuffergurh. The summit of tower is 25·27 feet above ground level markstone.
Niazichand T. S ... Lat. 30° 26′ 0″. Long. 70° 54′ 42″.	...	460·0	*Upper Surface of Pillar.*—It is situated close to a small "jugi" belonging to a man named Niaz, of the Chandia Belooch tribe; it is within the boundary of the village of Parihar, which is distant three or four miles to the east. It is in Thannah of Dára Din Panah, Tahsil Adu Kot, District Moozuffergurh. Summit of tower is 28·79 feet above ground floor mark.

Moozuffergurh; from Thul Megraj to Dára Din Panah.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Dára Din Panah P. S. ... Lat. 30° 34′ 2″. Long. 70° 58′ 35″.	489·83	...	*Upper Mark.*—It is situated on the top of the north-west bastion of old kacha Fort of Dára Din Panah. The bastion is solid, and elevated 48 feet above general level of ground. A solid paka pillar is countersunk into the bastion, 6 feet deep, and the markstone imbedded on its surface. It is in the Thannah of Dára Din Panah, Tahsil of Adu Kot, District Moozuffergurh.

SECTION IV.

Leia; from Dára Din Panah to Khairabad.

The levels traverse the eastern flank of the Indus Triangles as far as Sandi T. S., (about 20 miles north-east of Dehra Ismail Khan,) and then proceed along the main road to Mahri and Kalabagh, viâ Miawali, fixing the heights of several Stations of a secondary series of triangles along the river, between Kalabagh and Dehra Ismail.

Leia; from Dára Din Panah to Khairabad.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Sakhwala T. S. ... Lat. 30° 41′ 41″. Long. 71° 3′ 33″.	474·40	...	*Ground Level Markstone.*—It is situated about three-tenths of a mile south of the well of the same name, and about three and a half miles east of Paharpoor. It is in Thannah of Sultankot, Tahsil and District of Leia. Summit of tower is 25·6 feet above ground level markstone.
Toori T. S. ... Lat. 30° 43′ 38″. Long 70° 53′ 57″.	...	483·6	*Upper Surface of Pillar.*—It is situated in the Kadir land of the Indus, in the midst of the small village of the same name, about five miles from Sultankot, and two miles from Ranja-ki-busti. It is in the Thannah of Sultankot, Tahsil and District of Leia. The summit of tower is 18·9 feet above ground level markstone.
Farowala T. S. ... Lat. 30° 49′ 54″. Long. 70° 58′ 27″.	471·41	...	*Ground Level Markstone.*—It is situated close to the small village of the same name, and seven-tenths of a mile west of the village of Jaisul. In Thannah Sooltankot, Tahsil and District of Leia. The summit of tower is 29·8 feet above the ground level markstone.
Aliani T. S. ... Lat. 30° 58′ 32″. Long. 70° 52′ 6″.	...	506·8	*Upper Surface of Pillar.*—It is situated in the Kadir land of the Indus, between the villages of Aliani and Thori, at a distance of half a mile from each. It is in the Thannah, Tahsil, and District of Leia. The summit of tower is 23·3 feet above ground level mark.
Sukhwala T. S. ... Lat. 30° 57′ 50″. Long. 71° 0′ 33″.	490·56	...	*Ground Level Markstone.*—It is situated about one and three-quarter miles east of the city of Leia, close to the well of the same name. It is in the Kotwali, Tahsil, and District of Leia. The summit of tower is 22 feet above the ground level markstone.

Leia; from Dára Din Panah to Khairabad.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Shahpoor T. S. ... Lat. 31° 5′ 38″. Long. 70° 59′ 6″.	504·46	...	*Ground Level Markstone.*—It is situated on the edge of the Thull, close to the village of the same name, and about 200 yards north of the Salt Patrol Bungalow. It is in the Thannah, Tahsil, and District of Leia. The summit of tower is 28 feet above ground level markstone.
Mahomed Sha T S ... Lat. 31° 13′ 14″. Long. 71° 3′ 1″.	512·88	...	*Ground Level Markstone.*—It is situated about two-tenths of a mile south-east of the small village of Mahomed Sha Koreyshi, and about three miles east of the town of Karor. It is in the Thannah of Karor, Tahsil and District of Leia. The summit of tower is 20 23 feet above ground level markstone.
Raqua T. S. .. Lat. 31° 15′ 4″. Long. 70° 52′ 8″.	...	535·7	*Upper Surface of Pillar.*—It is situated on a small mound called Uttur Sing ka burj, being the site of an old tower built by a man of that name, about three-tenths of a mile west of village of Raqua. It is in the Thannah of Karor, Tahsil and District of Leia. The summit of tower is 30 feet above ground level markstone.
Jhirkil T. S. ... Lat. 31° 21′ 14″. Long. 71° 2′ 13″.	531·77	...	*Ground Level Markstone.*—It is situated on the Thull, at a distance of about 200 yards south-west of the village of Jhirkil, in Thannah Karor, Tahsil and District Leia. The summit of tower is 22 5 feet above ground level mark.
Kasain T. S. ... Lat. 31° 27′ 31″. Long. 71° 6′ 7″.	550 55		*Ground Level Markstone.*—It is situated three-tenths of a mile north-west of the well of the same name, and about two and a half miles north-west of the village of Noutok. It is in Thannah and Tahsil of Bukkur, District Leia. The summit of tower is 16·13 feet above markstone in ground floor.

Leia; from Dára Din Panah to Khairabad.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Barmi T. S. ... Lat. 31° 31′ 25″. Long. 70° 57′ 29″.	...	556·9	*Upper Surface of Pillar.*—It is situated in the Kader land of the Indus, south of the village of Barmi, in Thannah and Tahsil of Bhukkur, District Leia. The summit of tower is 21 feet above markstone in ground floor.
Bhukkur T. S. .. Lat. 31° 37′ 43″. Long. 71° 5′ 52″.	578·87	...	*Ground Level Markstone.*—It is situated in the northern extremity of the city of Bhukkur, on an elevated position, the site of an old house. Bhukkur is the Head-Quarters of a Tahsildari, and is in the Leia District. The summit of tower is 22·9 feet above ground level markstone.
Segra T. S. ... Lat. 31° 45′ 4″. Long. 71° 8′ 23″.	605·67	...	*Ground Level Markstone.*—It is situated on a high sand hill on the edge of the "Thull," three-tenths of a mile north-east of the village of Segra, in Thannah Durria Khan, Tahsil Bukkur, District Leia. The summit of tower is 16 feet above ground level markstone.
Amad Sindi T. S. ... Lat. 31° 52′ 43″. Long. 71° 9′ 54″.	618·96	...	*Ground Level Markstone.*—It is situated near a Ziyarat, so called in the edge of the Thull between Pansgrown to the north and Durria Khan to the south. It is in Thannah Durria Khan, Tahsil Bukkur, District Leia. The summit of tower is 26·5 feet above markstone in ground floor.
Sandi T. S. ... Lat. 32° 0′ 48″. Long. 71° 13′ 12″.	629·45	...	*Ground Level Markstone.*—It is situated four-fifths of a mile east of the village of Chap Sandi, and the same distance south-east of the tomb of Pir Bakhtiar, in Thannah Kulloor, Tahsil Bhukkur, District Leia. The summit of tower is 21 feet above ground floor mark.

Leia ; from Dára Din Panah to Khairabad.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Miani T. S. ... Lat. 31° 53′ 56″. Long. 71° 20′ 37″.	653·95	...	*Upper Surface of Pillar.*—It is situated on a high mound in the Thull of the Sind Sagur Doab, south-east of the hamlet of Paki Miani, in Thannah Kulloor, Tahsil Bhukkur, District Leia. Miani is about two miles east of the Military road from Dehra Ismail Khan to Shahpoor. The summit of tower is 28 feet above ground level markstone.
Heto T. S. ... Lat. 32° 2′ 48″. Long. 71° 27′ 4″.	668·88	...	*Upper Surface of Pillar.*—It is situated 3·9 miles north-east of the village so called, on the Thull of the Sind Sagur Doab; it is within a few yards of the Military road from Dehra Ismail Khan to Shahpoor. The village of Khussore is about four miles to the north-east of the station, which is in Thannah Kulloor, Tahsil Bhukkur, District Leia. The summit of tower is 32 feet above markstone in ground floor.
Malani Secondary S. ... Lat. 32° 7′ 23″. Long. 71° 15′ 47″.	634·14	...	Upper mark in a masonry pillar 3 feet high. It is situated on the edge of the Thull, on a sand hill a few yards north of the village Mulani, and about three and a half miles south of the town of Kulloor. It is in Thannah of Kulloor, Tahsil Bukkur, District Leia.
Jhamra Secondary S. ... Lat. 32° 13′ 8″. Long. 71° 20′ 4″.	637·20	...	Upper mark in a masonry pillar 2 feet high. It is situated in the centre of the village of Jhamra, in Thannah Pipli, Tahsil Mianwali, District Leia.
Pipli Secondary S. ... Lat. 32° 17′ 28. Long. 71° 23′ 30.	650·47	...	Surface of triangular pillar north of village of Pipli. Thannah Pipli, Tahsil Mianwali, District Leia.

Leia; from Dára Din Panah to Khairabad.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Aloowali Secondary S. ... Lat. 32° 22′ 12″. Long. 71° 26′ 36″.	656·04	...	Upper mark of a masonry pillar 3 feet high. It is situated on the western flank of the village so called, near the edge of the high ground. It is in Thannah Pipli, Tahsil Mianwali, District Leia.
Koondian B. M. ... Lat. 32° 27′ 37″. Long. 71° 30′ 21″.	665·45	...	The stone is 18 inches long, and imbedded 1 foot below the surface of the ground, in a hillock on the west side of the town of Koondian. It is distant 86 feet from the north-west corner of the Salt Chowkey, and 168 feet west of the south-west bastion of a dismantled Fort, on the summit of which bastion is a G. T. S. station. It is in the Thannah and Tahsil of Mianwali, District Leia.
Miawali Secondary S. ... Lat. 32° 34′ 32″. Long. 71° 32′ 52″.	681·27	...	Upper surface of a masonry pillar 2 feet high. It is situated on the high ground bordering the kadir land of the Indus, about 80 yards north of Mianwali, and adjoining the enclosure of Ali Mahomed's Ziyarat. The village of Bullokhel lies to the east. It is in the Thannah and Tahsil of Mianwali, District Leia.
Rokri Secondary S. .. Lat. 32° 39′ 49″. Long. 71° 32′ 49″.	687·15	...	Upper mark in a masonry pillar 2 feet high. It is situated on the site of a deserted town, seven-tenths of a mile east of the present town of Rokri, in Thannah Moch, Tahsil Mianwali, District Leia.
Tadawali B. M. ...	674·18	...	Surface of a stone 18 inches long, which is imbedded about 15 inches below the surface of the ground, in the compound of the Salt Agent's Bungalow at Tadawali village, north of the house, and under some small trees.
Khairabad B. M. ...	749·76	...	Surface of stone B. M., which is imbedded 1 foot below the surface of the high ground to the north of Khairabad village. It is covered with a mound of earth, and a deep ditch is cut round it.

SECTION V.

Dehra Ismail Khan; from Tibbi to Umarkhel.

The whole of the heights in this Section are determined trigonometrically, from the nearest Stations on the east bank of the Indus which were fixed by the leveling operations.

Dehra Ismail Khan ; from Tibbi to Umarkhel.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Tibbi P. S. ... Lat. 30° 59′ 44″. Long. 70° 42′ 15″.	...	540·6	*Upper Surface Markstone.*—It is situated on the centre and highest of three mounds, about one mile south-west of the village of Tibbi. The mound is on the edge of a ridge about 40 feet above the plain, running parallel to the hills, of which it apparently forms the commencement. It is in the Thannah of Dehra Futteh Khan, Tahsil Kolachi, District Dehra Ismail Khan. The station consists of a kacha masonry platform, 18 feet square and 4½ feet high, with a central paka pillar 4 feet in diameter, on surface of which the markstone is imbedded.
Futteh Khan T. S. ... Lat. 31° 7′ 9″. Long. 70° 46′ 39″.	...	532·4	*Upper Surface of Pillar.*—It is situated at south-east extremity of town of Dehra Futteh Khan, close to the round tower called "Nicholson-ka-burj." It is in Thannah Dehra Futteh Khan, Tahsil Kolachi, District Dehra Ismail Khan. The summit of tower is 27·75 feet above ground level mark.
Purwa T. S. ... Lat. 31° 33′ 25″. Long. 70° 48′ 14″.	...	567·4	*Upper Surface of Pillar.*—It is situated close to a paka well at the eastern extremity of the village of Purwa, in Thannah Meeran, Tahsil and District Dehra Ismail Khan. The summit of tower is 21·88 feet above markstone in ground floor.
Jalwala T. S. ... Lat. 31° 24′ 40″. Long. 70° 48′ 58″.	...	542·7	*Upper Surface of Pllar.*—It is situated about 300 yards west of the small village of the same name, on the road leading from Meeran to Kahiri. It is in Thannah Meeran, Tahsil and District Dehra Ismail Khan. The summit of tower is 25 feet above markstone in ground floor.
Chooni T. S. ... Lat. 31° 15′ 46″. Long. 70° 43′ 12″.	...	553·7	*Upper Surface of Pillar.*—It is situated on the mound on which the village of Chooni stands. It is in the Thannah of Dehra Futteh Khan, Tahsil and District of Dehra Ismail Khan. The summit of tower is 13·5 feet above markstone in ground floor.

Dehra Ismail Khan; from Tibbi to Umarkhel.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Rhoda T. S. ... Lat. 31° 40′ 30″. Long. 70° 53′ 25″.	...	579·1	*Upper Surface of Pillar.*—It is situated on the right bank of the Indus, about one mile north-east of the village of Rhoda, and close to the site of an old Khangah, which was destroyed in the flood of 1858. It is in the Thannah, Tahsil, and District of Dehra Ismail Khan. The summit of tower is 20·96 feet above ground level markstone.
Muriali T. S. ... Lat. 31° 47′ 48″. Long. 70° 56′ 41″.	...	595·2	*Upper Surface of Pillar.*—It is situated on the edge of the river, on the site of the old village of the same name, about one and a half miles south-east of the Cantonment of Dehra Ismail Khan, and about three-fourths of a mile east of the Jail. The summit of tower is 23·9 feet above markstone in ground floor.
Mandra T. S. ... Lat. 31° 55′ 58″. Long. 71° 0′ 18″.	...	599·0	*Upper Surface of Pillar.*—It is situated 600 yards north of the village of Mandra, in Thannah, Tahsil, and District of Dehra Ismail Khan. The summit of tower is 25 5 feet above markstone in ground floor.
Shek Budin H. S. ... Lat. 32° 17′ 49″. Long. 70° 50′ 49″.	...	4,516·0	*Upper Surface Markstone.*—It is situated on the well known hill of Shek Budin, sometimes called Shah Budin, and known by the Pathans as Mukdoom-ka-goond. It is the highest point of the range which divides Bunnoo and Murwut from the Derajat. The station is a few yards east of the Club House, and consists of a paka pillar 3½ feet in diameter, and 2½ feet above the ground level. It belongs to Thannah Paharpoor, District Dehra Ismail Khan. There are two good roads to the summit, one on the east from Punniala, the other on the north from the village of Aghzur-kheyl, in Murwut.

Dehra Ismail Khan; from Tibbi to Umarkhel.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Umarkhel H. S. ... Lat. 32° 25′ 32″. Long 71° 17′ 49″.	...	3,035·8	*Upper Surface Markstone.*—It is situated on the Khussore range of hills on the right bank of the Indus, between the Koorrum River and the Derajat. It lies about two miles west of the village so called, and is ascended therefrom by an easy but circuitous road. The station is marked by a pillar and platform 2 feet high. It is attached to Choki Keeree, Thannah Paharpoor, District Dehra Ismail Khan.
Maidan H. S. .. Lat. 32° 51′ 6″ Long. 71° 10′ 41″. (Kohat District.)	...	4,256·8	*Upper Surface Markstone.*—It is situated on one of the highest peaks of the double range of hills which separates the valley of Bunnoo from the valley of the Indus, between Kalabagh and the Koorrum River. It is on the eastern range, about one mile south-east of the village of Maidan, on the elevated table-land which connects the two ranges. The road ascends the hill near the village of Mittha on the south-east. The station consists of a paka pillar and platform 1 foot high.

SECTION VI.

Jhelum and Rawul Pindi.

From the Bench Mark at Khairabad, a small village at the foot of the hills adjacent to the well known Salt Marts of Mari and Kalabagh, the levels proceed along the Rawul Pindi Road, as far as Naka Toot, a hamlet of Pindi Gheb, and then diverge eastwards to Pari H. S.

Passing Pindi Gheb and Mianwali (on the Doomail Road) they trend eastwards, viâ Kotli, to the Kooshialgurh Road, and follow it to within two miles of Futtehjung, when they turn into the road over the Bara Chitta Range to Campbellpoor. About 14 miles from Futtehjung, they leave the road, and cross the country in a direct line to the West End Chuch Base Line, on the plain between Attok and Hazro.

Jhelum and Rawul Pindi ; from Mari (on the Indus) to Chuch Base Line, near Attok.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Bani T. S. ... Lat. 32° 56′ 15″. Long. 71° 41′ 56″.	...	1,682·8	*Upper Surface Markstone.*—It is situated on the south-east peak of the low range of hills on the left bank of the Indus, east of Kalabagh, from which it is distant in a direct line about five miles. It is in the Mouza of Bani, Pergunnah and Tappa of Bagi, Tahsil Talagang, Thannah Chakrala, District Jhelum. The station consists of a paka pillar and platform 2 feet high.
Sakesir H. S. ... Lat. 32° 32′ 35″. Long. 71° 58′ 37″.	...	4,994·4	*Upper Surface Markstone.*—It is situated on the highest point of the well known hill of that name, in the Thannah of Koobakie, Mouza of Oochali, Tahsil of Talagang, and District of Jhelum. The road leading up to the station commences near the village of Chitta, which is situated on the lake in the Soon valley. The top of pillar is 4 feet above the ground.
Niki B. M. ...	1,057·30	...	Stone B. M. imbedded on the eastern edge of the Kalabagh Road, near the Salt Agent's Bungalow at Niki, and 73 feet from the north-west corner of a small building occupied by Customs Chuprassies.
Shamahamdali B. M. ...	843·37	...	Stone B. M. imbedded in ground adjoining the enclosed tomb of Kaadam Shah to the north. The tomb is south of the road, and faces the village of Shamahamdali, which lies about 200 yards to the north.
Taman H. S. ... Lat. 32° 57′ 11″. Long. 72° 8′ 28″.	1,384·85	...	*Upper Surface Markstone.*—It is situated on a slightly elevated piece of ground about three miles south-west of the large village of Taman, in the Thannah of Taman, Tahsil of Talagang, and District of Jhelum. The surface of pillar is 2 feet above the ground.

Jhelum and Rawul Pindi; from Mari (on the Indus) to Chuch Base Line, near Attok.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Jatla H. S. ... Lat. 32° 48′ 24″. Long. 72° 25′ 5″.	...	2,076·2	*Upper Surface Markstone.*—It is situated on a low hill about three-fourths of a mile south of the well known village of the same name, in the Thannah and Tahsil of Talagang, and District of Jhelum. The summit of pillar is 2 feet above the surface of ground.
Sidhr H. S. ... Lat. 32° 59′ 43″. Long. 72° 41′ 31″.	...	1,728·0	*Upper Surface Markstone.*—It is situated on the site of the deserted village of Ajnala, in Mouza Sidhr, Tuppa, Tahsil, and Thannah of Chakwal, and District of Jhelum. The large village of Moonda lies about three miles to the south of the station, and that of Khursar the same distance to the north. The summit of pillar is 2 feet above the surface of the ground.
Jhamat H. S. ... Lat. 33° 15′ 38″. Long. 71° 59′ 27″.	...	1,785·8	*Upper Surface Markstone.*—It is situated on a low range of hills about three miles south-east of the large village of Jhamat, in Mouza Nari-ka-dok, Thannah Makad, Tahsil Pindi Gheb, District Rawul Pindi. The village of Malewal lies about four and a half miles north-east. The summit of pillar is 2 feet above the surface of ground.
Naka B. M. ...	937·41	...	Stone B. M. imbedded a little south of the road, on the first high ground by the roadside one meets in proceeding from Naka towards Toot; the ground is called Nulli, and is in the lands of Maka well.
Pari H. S. ... Lat. 33° 9′ 48″. Long. 72° 18′ 41″.	1,439·03	...	*Upper Surface Markstone.*—It is situated on the western extremity of a range of low sandstone hills, about one mile west of the village of Pari, in Mouza Pari, Tuppa and Tahsil Pindi Gheb, Thannah Jund, District Rawul Pindi. The town of Pindi Gheb is about six miles north of station. The summit of platform is 2 feet above surface of ground.

Jhelum and Rawul Pindi; from Mari (on the Indus) to Chuch Base Line near Attok.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Raowali B. M. ...	1416·67	...	Stone B. M. imbedded about 30 yards east of the road from Attok, where the latter crosses a ridge, on which the tri-junction pillars of Ningrial, Khair Sha Thulli, and Kullarwali Thutti—Ningrial, Kullarwali Thutti, and Gungawali dhok are placed, east and west of road. The B. M. is imbedded between the pillars.
Soorla H. S. Lat. 33° 23′ 21″. Long. 72° 39′ 27″. ...	...	2,141·8	*Upper Surface Markstone.*—It is situated on a range of low hills in the Mouza of Kundwal, Pergunnah and Tahsil of Pindi Gheb, Thannah of Jund, District of Rawul Pindi. The nearest large villages are Dhoornal to the south and Malal to the north. The station consists of a paka pillar 2 feet high and 3 feet in diameter, surrounded by a platform 14 feet square.
Pathrijala H. S. Lat. 33° 39′ 25″. Long. 72° 20′ 38″. ...	...	2,161·3	*Upper Surface Markstone.*—It is situated on a range of low hills connecting Bilandri Chitti and Barra Chitti or Nilab, in the Mouza of Kalidili, Pergunnah of Attok, Tahsil Pindi Gheb, Thannah Nari, Tuppa Tutho, District Rawul Pindi. The road is from the south-west side of range, and commences about one and a half miles from the village of Kalidili. The upper markstone is imbedded in the surface of a paka pillar 4 feet high.
Kotli B. M. ...	1,540·51	...	B. M. is a large slightly convex stone, imbedded ages past on the summit of north-east bastion of the ruined Fort of Kotli, or Rajah Hodi's Gurhi, about 10 miles south-west of Futtehjung.

Jhelum and Rawul Pindi ; from Mari (on the Indus) to Chuch Base Line, near Attok.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Basirah B. M. ...	1,711·71	...	Stone B. M. is imbedded on a high knoll called Basirah, about two miles west of Futtehjung, in the lands of the village of Sadkal, where the Kohat Road bends almost at a right angle. The knoll adjoins to the south a patch of cultivation called Chowee Miawali.
Jabi B. M. ...	1,349·54	...	Stone B. M. is imbedded on a ridge about 59 feet south of the point where the Campbellpoor and Futtehjung Road crosses. The village of Jabi is situated at the northern extremity of the ridge.
Koua B. M. ...	1,160·71	...	Stone B. M. is imbedded on the remains of an old building called Mahri, adjoining a wild olive tree, on the summit of an elevation occupied by graves, to the north of the village of Koua.
West End Chuch Base ... Lat. 33° 53′ 12″. Long. 72° 25′ 22″.	1,018·15	...	Markstone at summit of vault, which is 3·54 feet above the true mark on surface of pillar. It is situated on the south end of a mound south of the village of Kaloo (chota) in Chuch, in the Thannah of Hazro, Pergunnah Attok, Tuppa Haveli, Tahsil Hassan Abdal, District Rawul Pindi.
East End Chuch Base ... Lat. 33° 57′ 8″. Long. 72° 32′ 2″.	...	1,052·7	Markstone at summit of vault, which is 3·41 feet above the true mark on surface of pillar. It is situated on the southern end of a mound in Mouza of Agzar in Chuch, Thannah Hazro, Tuppa Sircani, Pergunnah Attok, Tahsil Hassan Abdal, District Rawul Pindee.

Jhelum and Rawul Pindi ; from Mari (on the Indus) to Chuch Base Line, near Attok.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Loiset H. S. Lat. 33° 46′ 44″. Long. 72° 38′ 19″. ...	...	2,388·8	*Upper Surface Markstone.*—It is situated on the range of hills immediately south of the large town of Bhoorhan. It is in the Mouza of Bhoorhan, Pergunnah of Attok, Tuppa of Haveli, Tahsil and Thannah of Hassan Abdal, District of Rawul Pindi. The road to the station commences on the Bhoorhan side of the hill. The height of pillar is 3 feet above the level of ground. There is another G. T. station on the same hill to the north-east, marked by a pillar of stones.
Khagriana H. S. Lat. 33° 44′ 12″. Long. 73° 0′ 6″. (Hazara District.) ...	...	3,939·4	*Upper Surface Markstone.*—It is situated on the hill of that name, the water-shed of which is the boundary between the districts of Hazara and Rawul Pindi. The small village of Kytla is about one mile south-west on the same hill. The road leading to the station commences at the large village of Shadutta, in Thannah, Tahsil, and District of Rawul Pindi. The summit of pillar is 2 feet above ground.
Gandgurh H. S. Lat. 33° 56′ 55″. Long. 72° 45′ 48″. (Hazara District.) ...	...	4,401·0	*Upper Surface Markstone.*—It is situated on the summit of the hill of that name, and on the site of the Peerthan, in Pergunnah of Gandgurh, Thannah Darchitti, and District Hazara. The best road is from the village of Bhofat, by the village and fortlet of Darchitti. The summit of pillar is 2 feet above the ground.

SECTION VII.

Bahawulpoor; from Machka to Fazilka.

The levels diverge from the Indus series at Moorghai B. M., in the Dehra Gazi Khan District, cross the Indus a few miles below Mithankote, and traverse the district roads viâ Ahmudpoor, Bahawulpoor, and Bahawulgurh. Only a few of the principal Trigonometrical Stations in the south of the district were ready to be connected, when the leveling operations were carried through Bahawulpoor.

Bahawulpoor ; from Machka to Fazilka.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Machka T. S. ... Lat. 28° 16′ 42″. Long. 69° 41′ 48″.	...	273·1	*Upper Surface of Pillar.*—It is situated on the left bank of the Indus, on an Island covered with thick jungle. The village of Machka lies about three-fourths of a mile west, and Daolatpur about one and a half miles north of the station. The tower is 24·58 feet above the ground level markstone, and is in the Bahawulpoor territory.
Daowala T. S. ... Lat. 28° 20′ 13″. Long. 69° 52′ 58″.	...	282·0	*Upper Surface of Pillar.*—It is situated on low flat marshy ground, covered with dense jungle. The village of Daowala is about a mile to south-south-west, and the village of Mobarek Bareh about two miles to the south-south-east in the Bahawulpoor territory. There is a basement of solid masonry about 8 feet above the level of the ground, upon which the tower is raised to a height of 22·38 feet from the markstone in ground floor of basement.
Serhin T. S. ... Lat. 28° 33′ 33″. Long. 70° 8′ 8″.	...	303·6	*Upper Surface of Pillar.*—It is situated in an open spot of ground on the left bank of the Indus, about one-third of a mile west of the small village of Serhin, in the Bahawulpoor territory. The village of Thool is about a mile to the south-west. The tower is 26·90 feet above the markstone in ground floor.
Shapoor T. S. ... Lat. 28° 43′ 17″. Long. 70° 21′ 47″.	288·42	...	*Ground Level Markstone.*—It is situated on the left bank of the Indus. The village of Thapoor is about half a mile to the south-south-east, Rangpoor two miles south-east by east, and Hassan-ka-Thool about 2·2 miles north-north-east. The tower is 31·00 feet above markstone in floor of basement, and is in the Bahawulpoor territory.

Bahawulpoor ; from Machka to Fazilka.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Taru T. S. Lat. 28° 58′ 29″. Long. 70° 33′ 23″. ...	...	337·5	*Upper Surface of Pillar.*—It is situated on an island formed by a branch of the Punjnud and its present channel, and about two miles above the junction of the Punjnud and the Indus. The hamlet of Taru is about 0·8 mile to the north-east, in the Bahawulpoor territory. The tower is 28·08 feet above the mark-stone in the basement.
Tibee B. M. ...	295·57	...	Stone B. M. is imbedded 100 yards east of the Post road from Mithankote to Khanpoor, on high ground at the south-west corner of the hamlet of Tibbee (Yarowala), which is in the Kardari of Sirdargurh, as included in the bounds of Hajipoor village. The greater portion of the hamlet is attached to Ghaospoor, District Bahawulpoor.
Chuharlar T. S. Lat. 28° 52′ 52″. Long. 79° 40′ 52″. ...	301·81	...	*Ground Level Markstone.*—It is situated about half a mile east of the small hamlet of that name, about two miles north-east of the town of Futtehpoor, and the same distance south-east of the town of Kedirpur, in the Bahawulpoor territory. The summit of tower is 24 feet above ground level mark.
Khanbila B. M. ...	305·56	...	Stone B. M. imbedded under a large Peepul tree on the south-west edge of the town of Khanbela, in the Bahawulpoor territory.
Khanbila T. S. Lat. 28° 59′ 13″. Long. 70° 46′ 49″. ...	309·71	...	*Ground Level Markstone.*—It is situated about one and a half miles north of the town of Khanbela, in the Bahawulpoor territory. The summit of tower is 25·88 feet above the ground level mark-stone.

Bahawulpoor ; from Machka to Fazilka.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Lunjiwar S. ... Lat. 28° 48′ 20″. Long. 70° 31′ 50″.	290·29	...	*Ground Level Markstone.*—It is situated on an open grassy plain in the Kardary of Gaospoor in the Bahawulpocr Territory. The village of Lanjiwar is about half a mile south-east, and that of Koreishi about three-fifths of a mile west-south-west of the tower, the summit of which is 30·13 feet above ground floor mark.
Laloowali T. S. .. Lat. 28° 43′ 19″. Long. 70° 41′ 59″.	296·30	...	*Ground Level Markstone.*—It is situated within the small village of the same name, about five miles north of the town of Khanpur, in the Bahawulpoor territory. The summit of tower is 30·96 feet above the markstone in ground floor.
Kundani T. S. ... Lat. 28° 49′ 38″. Long. 70° 49′ 33″.	300·03	...	*Ground Level Markstone.*—It is situated in a tract of open jungle about one mile west of the small village of the same name, and about three miles south of the town of Paka Lar. The summit of tower is 25·85 feet above the ground level markstone.
Magreja S. ... Lat. 28° 57′ 24″. Long. 70° 56′ 36″.	306·84	...	*Ground Level Markstone.*—It is situated close to the hamlet of the same name, about one and a half miles east of the town of Allabad, in the Bahawulpoor territory. The summit of tower is 30·54 feet above ground level mark.
Paphra S. ... Lat. 29° 5′ 49″. Long. 70° 52′ 13″.	316·39	..	*Ground Level Markstone.*—It is situated about one and a half miles north-north-west of the village of Miani, in the Bahawulpoor States. The summit of tower is 25·04 feet above ground level mark.

Bahawulpoor ; from Machka to Fazilka.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Chani Khan T. S. ... Lat. 29° 5′ 14″. Long. 71° 3′ 14″.	319·59	...	*Ground Level Markstone.*—It is situated in an extensive tract of low jungle in the vicinity of the town of Chani Khan ki Got, which lies about three-fifths of a mile to the north, in the Bahawulpoor territory. The summit of the tower is 28·45 feet above the markstone in the ground floor.
Chani Khan B. M. ... Lat. 29° 5′ 10″. Long. 71° 6′ 17″.	327·18	...	Stone B. M. imbedded on the site of a deserted village crossed by the road near Chani Khan's well.
Ahmadpoor B. M. ...	348·12	...	Stone B. M. is imbedded east of the town, on a mound called Kumman Tibba, attached to a ruined dwelling, Kumman Haveli, surrounded by tombs. The mound lies 50 yards north of the Ahmadpoor and Bahawulpoor Road.
Pirhar T. S. ... Lat. 29° 10′ 34″. Long. 71° 10′ 9″.	348·20	...	*Ground Level Markstone.*—It is situated on one of a number of sand hills about three quarters of a mile north-north-east of the village of Pirhar, and about one mile east-north-east of the village of Dhingana. It is in the Kardary of Gaospoor, in the Bahawulpoor territory. The summit of the tower is 12·17 feet above the ground level mark.
Noor Kanch T. S. ... Lat. 29° 13′ 54″. Long. 71° 18′ 38″.	348·89	...	*Ground Level Markstone.*—It is situated in a level tract of low jungle north of the town of Ahmadpoor, and takes its name from a few huts a short distance to the south-west. The village of Mulkana lies about two and a half miles west-north-west, and Pirwa about the same distance east. The summit of the tower is 29·57 feet above the ground level markstone.
Jamrani B. M. ...	367·18	...	Stone B. M. is imbedded near the Mosque in Jamrani, on the western edge of the road from Ahmadpoor to Bahawulpoor.

Bahawulpoor ; from Machka to Fazilka.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Dateh Khan P. S. ... Lat. 29° 15′ 27″. Long. 71° 26′ 48″.	397·16	...	Markstone on surface of Paka Pillar, which is 3 feet above the ground. It is situated on the summit of one of a group of sand hills known as Dateh wala Tibba, about seven-eighths of a mile west of the large village of Mobarikpur, which contains a small mud Fort. The height of the markstone is 41 feet above the general level of country on the north.
Bahawulpoor B. M. ... Lat. 29° 22′ 52″. Long. 71° 41′ 40″.	375·03	...	Stone B. M. is imbedded at the southern base of a masonry monument erected over an Englishman, who died during the march of Indian Troops to Candahar. The tomb, a conspicuous object, lies one and a half miles west of the town of Bahawulpoor, by the roadside.
Baki Dera B. M. ...	390·07	...	Stone B. M. is imbedded to the south-west of the village of Baki Dera, on the village side of the road from Bahawulpoor to Ferozpoor.
Noor Mahamad B M. ...	407·37	...	Stone B. M. is imbedded near Noor Mahamad ki Got, across the road opposite an old grave-yard called Rajan Kathar ki Kabaristan, about one mile north-east of the village of Shah Mahamad ki Got.
Khyrpoor B. M. ... Lat. 29° 35′ 9″. Long. 72° 16′ 54″.	418·75	...	Stone B. M. is imbedded opposite to and north of the town of Khyrpoor; it is about 250 yards in a direct line from the Moulvie's Khangah, which bears 150° north.
Kaim Raees ki Got B. M..	434·92	...	Stone B. M. is imbedded to the south of the town of Kaim Raees ki Got. It is distant 167 yards, and bears north 261° from the north-west angle of the fort. The northern Minaret of Kaim Raees Mosque is distant about 172 yards, and bears north 17° from the B. M.

Bahawulpoor ; from Machka to Fazilka.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Ismailpoor B. M. ...	452·23	...	Stone B. M. is imbedded by the road side, one mile south of the village of Ismailpoor, and 300 yards east of a ruined dwelling, and two and three-fourths of a mile north-east of the town of Hasilpoor.
Golam Ali B. M. ...	464·46	...	Stone B. M. is imbedded north-east of the Canal, and adjoining the small hamlet of Golam Ali, which is situated about two miles west of Shuhur Fureed, and the same distance south-west of Seealan ka bustee.
Noor Shah B. M. ...	481·85	...	Stone B. M. is sunk by the road side to the east of it, opposite Noor Shah's Khangah.
Kasimka B. M. ...	492·41	...	Stone B. M. is sunk near the road side about 300 yards north of Kasimka village.
Mukhdoom B. M. ...	510·53	...	Stone B. M. is sunk on the road side about half a mile west of Mukhdoom village, and 300 yards south of a well of Sirdara Baloche.
Boonga Alum Shah B. M....	520·45	...	Stone B. M. is imbedded 100 yards south of the well of Golam Hussein at Boonga Alum Shah, which is about six miles south-west of Bahawulgurh.
Akbar-da-boonga T. S. ...	538·35	...	Ground level markstone of a tower built at the junction of the Sutlej series, with the Jogi Tila meridional series, but not yet fixed by the principal triangulation.
Pir Khalis B. M. ...	548·73	...	Stone B. M. is imbedded in the northern slope of a mound called Paka Kot at Pir Khalis, and is distant 350 yards south-west of Pir Khalis Khangah, and about seven miles north-east of the town of Bahawulgurh.

Bahawulpoor ; from Machka to Fazilka.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Gourdana B. M. ...	556·00	...	Stone B. M. is imbedded on the north side of the road, in the grounds of the town of Gourdana, and is distant one and three-fourths of a mile north-west of Gourdana fort. The village of Soonam Rai is distant three-fourths of a mile, and bears north 303° from the B. M.
Jaga ki Aihli B. M. ...	570·74	...	Stone B. M. is imbedded by the road side on the Bahawulpoor boundary.

SECTION VIII.

Ferozpoor District; from Fazilka to Ferozpoor Cantonments.

The line of levels follows the main road from Bahawulpoor to the Station of Ferozpoor.

Ferozpoor; from Fazilka to Ferozpoor.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Milestone at Fazilka ...	585·32	...	Summit of milestone which is imbedded in masonry, and designated "249 miles to Delhi." It is situated on the Ferozpoor road, just opposite to the hospital, and on the eastern side of the town of Fazilka, about a quarter of a mile north-east of the kacheri.
Fazilka B. M. ...	587·94	...	Stone B. M. is imbedded opposite the kacheri, and near the hospital at Fazilka.
Bodlah Noor Shah B. M. ...	586·20	...	Stone B. M. is imbedded on the north-west side of the road near Bodlah Noor Shah, and south of old fort Jamal deen ka kote.
Mahamad Khan Vutoo B. M.	588·76	...	Stone B. M. is imbedded at Mahamad Khan Vutoo, which is about two miles south-west of the village of Vutoo.
Amira B. M. ...	613·51	...	Stone B. M. is imbedded in a mound on the south side of the road in the centre of Amira village.
Lukha Dogur B. M. ...	625·32	...	Stone B. M. is imbedded on the south side of the road about mid-distance between the wells of Lukha Dogur and Dudhia.
Naia Kila B. M. ...	636·24	...	Stone B. M. is imbedded on the northern edge of the halting ground opposite Mumdot, and facing the south front of the "Naia Kila."
Ferozpoor Cantonment B. M.	645·48	...	Stone B. M. is imbedded near the Sentry Box of the Quarter Guard of the old Horse Artillery Lines. A small tank with masonry ghats lies a few yards to the west of the stone. The east end of the sick horse stables runs up abreast of the stone.

SECTION IX.

Ferozpoor to Ambala.

From the Bench Mark in the Cantonment of Ferozpoor, the levels proceed along the Grand Trunk Road to Ambala, viâ Loodiana. All the most permanent milestones by the road side were connected, and Bench Marks were imbedded, as usual, at distances of about 12 miles apart. The Daraoli and Tamalawala Towers of the Gurhagarh Meridional Series were connected, trigonometrically, with the Bench Marks at Dugroo and Kalian.

Ferozpoor to Ambala.

Names of Stations.			Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Ferozpoor 2 / Loodiana 74	Mile-stone.	On G. T. Road from Ferozpoor to Loodiana.	648·59	...	Top of small masonry block behind mile-stone.
Ferozpoor 3 / Loodiana 73	"		649·44		
Ferozpoor 4 / Loodiana 72	"		649·94		
Ferozpoor 5 / Loodiana 71	"		652·18		
Ferozpoor 6 / Loodiana 70	"		654·79		
Ferozpoor 7 / Loodiana 69	"		657·17	...	Top of milestone.
Ferozpoor 8 / Loodiana 68	"		662·82		
Ferozpoor 9 / Loodiana 67	"		666·12		
Ferozpoor 10 / Loodiana 66	"		666·00		
Ferozpoor 12 / Loodiana 64	"		670·79		
Ferozpoor 14 / Loodiana 62	"		681·01		
Ferozpoor 15 / Loodiana 61	"		681·00		
Kalian Chowky B. M.		...	675·97	...	Stone B. M. is imbedded on the north side of the road between the 15th and 16th milestones from Ferozpoor, opposite Kalian Chowky, between the inner and outer ditches.
Ferozpoor 17 / Loodiana 59	Mile-stone.	On road from Ferozpoor to Loodiana.	683·84	...	Top of milestone.
Ferozpoor 19 / Loodiana 57	"		687·42		
Ferozpoor 20 / Loodiana 56	"		691·23		
Ferozpoor 21 / Loodiana 55	"		692·44		
Ferozpoor 22 / Loodiana 54	"		695·30		
Ferozpoor 23 / Loodiana 53	"		697·19		
Ferozpoor 25 / Loodiana 51	"		700·26		
Ferozpoor 26 / Loodiana 50	"		701·91		
Ferozpoor 27 / Loodiana 49	"		709·69		

Ferozpore to Ambala.

Names of Stations.		Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Dugroo Thana B. M.	...	717·26	...	Stone B. M. is imbedded on the southern side of the road, about 50 yards from the north-east corner of Dugroo Thana, which is situated between the 27th and 28th milestones from Ferozpore.
Ferozpore 29 Loodiana 47 Mile-stone.	On road from Ferozpore to Loodiana.	725·89		
Ferozpore 30 Loodiana 46 "		728·19		
Ferozpore 31 Loodiana 45 "		729·60		
Ferozpore 33 Loodiana 43 "		730·86		
Ferozpore 35 Loodiana 41 "		733·38	...	Top of milestone.
Ferozpore 36 Loodiana 40 "		734·04		
Ferozpore 37 Loodiana 39 "		736·92		
Ferozpore 39 Loodiana 37 "		734·88		
Ferozpore 40 Loodiana 36 "		738·4		
Mainawala B. M.	...	735·53	...	Stone B. M. is imbedded on the southern side of the road, opposite the Thana, facing the encamping ground at Mainawala.
Ferozpore 42 Loodiana 34 Mile-stone.	On road from Ferozpore to Loodiana.	749·05		
Ferozpore 44 Loodiana 32 "		749·77		
Ferozpore 45 Loodiana 31 "		750·77		
Ferozpore 46 Loodiana 30 "		750·74		
Ferozpore 47 Loodiana 29 "		755·93		
Ferozpore 48 Loodiana 28 "		756·19	...	Top of milestone.
Ferozpore 49 Loodiana 27 "		759·19		
Ferozpore 50 Loodiana 26 "		759·76		
Ferozpore 51 Loodiana 25 "		764·56		
Ferozpore 52 Loodiana 24 "		766·98		

Ferozpore to Ambala.

Names of Stations.			Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Jagraon B. M.		...	764·89	...	Stone B. M. is imbedded on the south side of the road near the north-east corner of chowky, near the Tehsil at Jagraon.
Ferozpore 54, Loodiana 22	Mile-stone.	On road from Ferozpore to Loodiana.	771·94	...	Top of milestone.
Ferozpore 55, Loodiana 21	"		772·90		
Ferozpore 56, Loodiana 20	"		776·55		
Ferozpore 57, Loodiana 19	"		777·11		
Ferozpore 58, Loodiana 18	"		784·65		
Ferozpore 59, Loodiana 17	"		784·18		
Ferozpore 60, Loodiana 16	"		784·19		
Ferozpore 61, Loodiana 15	"		790·47		
Ferozpore 62, Loodiana 14	"		793·07		
Ferozpore 63, Loodiana 13	"		794·80		
Ferozpore 64, Loodiana 12	"		800·23		
Ferozpore 65, Loodiana 11	"		802·81		
Dhaka Chowky B. M.		...	796·13	...	Stone B. M. is imbedded opposite the encamping ground at the 15th or Dhaka Chowky, Loodiana Division, on the northern side of the road between it and the Chowky.
Ferozpore 66, Loodiana 10	Mile-stone.	On road from Ferozpore to Loodiana.	805·58	...	Top of milestone.
Ferozpore 67, Loodiana 9	"		805·39		
Ferozpore 69, Loodiana 7	"		810·76		
Ferozpore 70, Loodiana 6	"		806·48		
Ferozpore 71, Loodiana 5	"		807·88		
Ferozpore 72, Loodiana 4	"		812·57		
Ferozpore 73, Loodiana 3	"		809·30		
Ferozpore 74, Loodiana 2	"		814·40		

Ferozpore to Ambala.

Names of Stations.		Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Loodiana B. M. ...		806·26	...	Stone B. M. is imbedded on the northern side of the road, nearly opposite the junction of the Ferozpore and Ambala roads, near the encamping ground.
Loodiana 2, Ambala 69 Milestone.	On road from Loodiana to Ambala.	817·95	...	Top of milestone.
Loodiana 3, Ambala 68 "		822·14		
Loodiana 5, Ambala 66 "		834·21		
Loodiana 6, Ambala 65 "		837·82		
Loodiana 7, Ambala 64 "		838·16		
Loodiana 8, Ambala 63 "		840·69		
Loodiana 9, Ambala 62 "		843·04		
Loodiana 10, Ambala 61 "		846·18		
Kado Tower Station ... Lat. 30° 46′ 37″. Long. 76° 5′ 31″. (Of Rahoon Meridional Series.)		864·04	...	*Ground Level Markstone.*—The station is situated on the site of a deserted village in the Mouza of Kado, Pergunnah Tehsil, and Thana of Pael and territory of Puttiala. The summit of the tower is 32 feet above the ground level markstone.
Loodiana 12, Ambala 59 Milestone.		850·79	...	Top of milestone.
Daoraha B. M. ...		843·69	...	Stone B. M. is imbedded opposite Daoraha Chowky, No. 8 of the Puttiala territory, between it and the road.
Loodiana 14, Ambala 57 Milestone.	On road from Loodiana to Ambala.	853·49	...	Top of milestone.
Loodiana 17, Ambala 54 "		853·75		
Loodiana 18, Ambala 53 "		864·16		
Loodiana 19, Ambala 52 "		861·12		
Loodiana 20, Ambala 51 "		860·92		

Ferozpore to Ambala.

Names of Stations.			Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Loodiana 21, Ambala 50	Mile-stone.	On road from Loodiana to Ambala.	861·36	...	Top of milestone.
Loodiana 23, Ambala 48	"	On road from Loodiana to Ambala.	866·03	...	Top of milestone.
Loodiana 24, Ambala 47	"	On road from Loodiana to Ambala.	868·45	...	Top of milestone.
Loodiana 25, Ambala 46	"	On road from Loodiana to Ambala.	867·96	...	Top of milestone.
Loodiana 26, Ambala 45	"	On road from Loodiana to Ambala.	867·53	...	Top of milestone.
Loodiana 27, Ambala 44	"	On road from Loodiana to Ambala.	871·10	...	Top of milestone.
Khunnah B. M.		...	863·64	...	Stone B. M. is imbedded on the northern side of the road, a little to the east of the Tehsil gate at Khunnah encamping ground.
Loodiana 28, Ambala 43	Mile-stone.	On road from Loodiana to Ambala.	873·04	...	Top of milestone.
Loodiana 30, Ambala 41	"	On road from Loodiana to Ambala.	873·05	...	Top of milestone.
Loodiana 31, Ambala 40	"	On road from Loodiana to Ambala.	873·50	...	Top of milestone.
Loodiana 32, Ambala 39	"	On road from Loodiana to Ambala.	874·90	...	Top of milestone.
Loodiana 35, Ambala 36	"	On road from Loodiana to Ambala.	874·45	...	Top of milestone.
Loodiana 37, Ambala 34	"	On road from Loodiana to Ambala.	877·07	...	Top of milestone.
Barah B. M.		...	870·62	...	Stone B. M. is imbedded alongside the Thana gate at Barah encamping ground, between the east side of the Thana and the Trunk Road.
Loodiana 38, Ambala 33	Mile-stone.	On road from Loodiana to Ambala.	873·71	...	Top of milestone.
Loodiana 40, Ambala 31	"	On road from Loodiana to Ambala.	874·37	...	Top of milestone.
Loodiana 41, Ambala 30	"	On road from Loodiana to Ambala.	875·11	...	Top of milestone.
Loodiana 43, Ambala 28	"	On road from Loodiana to Ambala.	875·07	...	Top of milestone.
Loodiana 44, Ambala 27	"	On road from Loodiana to Ambala.	876·03	...	Top of milestone.
Loodiana 45, Ambala 26	"	On road from Loodiana to Ambala.	876·67	...	Top of milestone.
Loodiana 46, Ambala 25	"	On road from Loodiana to Ambala.	877·15	...	Top of milestone.
Loodiana 47, Ambala 24	"	On road from Loodiana to Ambala.	875·92	...	Top of milestone.

Ferozpore to Ambala.

Names of Stations.		Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Oogana B. M.	...	874·32	...	Stone B. M. is imbedded near the north-east corner of the Thana, opposite the encamping ground at Oongana.
Loodiana 49 / Ambala 22 Mile-stone.	On road from Loodiana to Ambala.	880·99	...	Top of milestone.
Loodiana 50 / Ambala 21 "	On road from Loodiana to Ambala.	884·40	...	Top of milestone.
Loodiana 51 / Ambala 20 "	On road from Loodiana to Ambala.	886·18	...	Top of milestone.
Loodiana 53 / Ambala 18 "	On road from Loodiana to Ambala.	886·66	...	Top of milestone.
Loodiana 54 / Ambala 17 "	On road from Loodiana to Ambala.	886·58	...	Top of milestone.
Loodiana 55 / Ambala 16 "	On road from Loodiana to Ambala.	888·67	...	Top of milestone.
Loodiana 56 / Ambala 15 "	On road from Loodiana to Ambala.	886·01	...	Top of milestone.
Loodiana 57 / Ambala 14 "	On road from Loodiana to Ambala.	891·71	...	Top of milestone.
Loodiana 58 / Ambala 13 "	On road from Loodiana to Ambala.	897·52	...	Top of milestone.
Loodiana 59 / Ambala 12 "	On road from Loodiana to Ambala.	894·10	...	Top of milestone.
Mogul Serai B. M.	...	888·43	...	Stone B. M. is imbedded close to the Trunk road in front of the new Serai at the north-west corner of the encamping ground at Mogul Serai.
Loodiana 65 / Ambala 6 Mile-stone.		896·10	...	Top of milestone.
Loodiana 66 / Ambala 5 "	...	899·65	...	Top of milestone.
Loodiana 67 / Ambala 4 "	...	902·66	...	Top of milestone.
Ambala Church B. M.	...	898·84	...	Stone B. M. is imbedded 3 feet below the surface of ground at a bearing of 299° from the westernmost door of the Church, and 75 yards distant. It adjoins the western wall of the Church compound.
Ambala Church step	...	901·53	...	Centre of upper (3rd) step of the western doorway of the Church tower, just outside the wooden sill.

SECTION X.

Ambala to Dehra Doon viâ Saharanpore.

The levels of this Section originate at Ambala Church. Following the main road from Ambala they cross the Western and Eastern Jumna Canals as well as the Jumna River itself. Bench Marks have been laid down at the canals and at other points along the road, such as Jagadri and Sirsawa, and also in the Saharanpore Church yard.

From Saharanpore the line, still following the road, crosses the Sewalik range by the Mohun Pass and descends into the Doon for a short distance and turning to the westward terminates at the east end of the Dehra Doon Base Line.

Ambala to Dehra Doon.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Ambala Church ...	901·61	...	Centre of western door-way. Surface of the upper step just outside the wooden door sill.
Malana ...	919·40	...	Top of south-east boundary pillar of the encamping ground.
Malana B. M. ...	914·16	...	Stone B. M. is imbedded in the south-east corner of the encamping ground, about 20 yards west of the pillar.
Tomb ...	919·95	...	Top of a suttee about half a mile from the encamping ground.
Mahadeo's Mark ..	916·43	...	Surface of plaster level.
Chapar ...	922·71	...	Top of south-west pillar of the encamping ground.
Chapar B. M. ...	919·26	...	Stone B. M. is imbedded near the Thana.
Jagadri B. M. ...	923·52	...	Stone B. M. is imbedded at the chowky opposite the encamping ground.
Jagadri Temple ...	924·65	...	Surface of the floor in front of the porch of a way side temple, about half a mile from the encamping ground, and near the new Serai.
Madalpoor B. M. ...	906·05	...	Stone B. M. is imbedded near the bridge of that name, on the south side of the road, and west of the Western Jumna Canal.
Bikanpoor Well ...	880·76	...	Upper surface of masonry of a well near the chowky.
Sirsawa B. M. ...	896·45	...	Stone B. M. is imbedded in front of the Serai door-way.
Eastern Jumna Canal B. M.	907·25	...	G. T. Survey stone B. M. is imbedded near the bridge, east of the canal and north of the road.
Eastern Jumna Canal B. M.	907·46	...	Surface of a perforated stone slab on the left bank of the canal fall.

Ambala to Dehra Doon.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Saharanpore Church ...	902·73	...	Surface of the stone slab on the west side of the south porch.
Saharanpore, 4th Milestone.	912·07	...	On the Saharanpore and Dehra road. Top of stone.
Kylaspore B. M ...	910·84		
On the Saharanpore and Dehra road. Saharanpore ... Milestone 6th	916·79	...	Top of stone.
" ... 7th	920·77		
" ... 8th	927·68		
" ... 9th	928·30		
" ... 10th	935.13		
" ... 11th	940·62		
" ... 12th	947·27	...	Base of broken mile pillar.
" ... 14th	974·79	...	Top of stone.
" ... 15th	979·65		
Bhatpoora B. M. ...	954·20	...	Stone B. M. is imbedded in a field near the village, about 12 yards east of the new road to Mohun.
Mohun B. M. ...	1,489·40	...	Stone B. M. is imbedded about 6 yards east of the new road.
Shorepore B. M. ...	2,606·31	...	Stone B. M. is imbedded at the head of the pass at the highest part of the old road above Shore's chowky.
8th Milestone from Dehra. .	2,504·79	...	Top of pillar.
Mohobawala B. M. ...	2,096·56	...	Stone B. M. is imbedded on the west side of the road to Dehra.
East end Dehra Doon Base line G. T. S. Lat. 30° 17′ 8″. Long. 78° 1′ 1″.	1,957·65	...	*Ground Level Markstone.*—This station is on the extremity of one of the spurs of the Ghati range. The Asan River winds round the foot of the spur. The nearest village is Mohobawala, about a mile to the eastward.

SECTION XI.

Saharunpore to Allyghur viâ Meerut.

The levels of this Section start from the Saharunpore Church, and proceeding along the high road to Meerut, connect en route Bench Marks left at Deoban, Moozufurnugur, and Kutowlee, at which latter place connection has been made with the Ganges Canal levels.

Two stone Bench Marks in the Meerut Churchyard and a Mark at the entrance of the building itself, afford data for future reference.

From Meerut to Allyghur the line of levels coincides with that of the Grand Trunk Road throughout, except where for a short distance it passes along the embankment of the East Indian Railway, with which connection has been made at various points. Bench Marks have been left at Boolundshuhr and elsewhere, and nearly all the milestones have been connected.

At Allyghur the levels close on a Bench Mark and paka well in the encamping ground.

Saharanpore to Allyghur.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Saharanpore Church ...	902·73	...	Surface of stone slab on the west side of the south porch.
On the road from Saharanpore to Meerut. Mile-stone. Saharanpore ... 1 Moozufurnugur 36	906·55	...	Top of stone.
Saharanpore ... 2 Moozufurnugur 35	902·35		
Saharanpore ... 3 Moozufurnugur 34	900·28		
Saharanpore ... 4 Moozufurnugur 33	897·67		
Saharanpore ... 5 Moozufurnugur 32	882·16		
Saharanpore ... 7 Moozufurnugur 30	888·12		
Well near chowky	879·27	...	On the north side of the road about half way between the 7th and 8th milestones. Upper surface of inner circle.
Saharanpore ... 8 Moozufurnugur ... 29	879·57	...	Top of stone.
Bhatkheri B. M.	876·09	...	Subsidiary B. M. sunk on the south-west side of the road, about half way between the 8th and 9th milestones, near the village of that name.
On the road from Saharanpore to Meerut. Saharanpore ... 9 Moozufurnugur... 28	878·62	...	Top of stone.
Saharanpore ... 10 Moozufurnugur... 27	878·16		
Saharanpore ... 11 Moozufurnugur... 26	873·57		
Saharanpore ... 12 Moozufurnugur... 25	867·45		
Saharanpore ... 13 Moozufurnugur... 24	862·86		
Saharanpore ... 15 Moozufurnugur... 22	860·75		
Saharanpore ... 16 Moozufurnugur... 21	852·19		
Saharanpore ... 17 Moozufurnugur... 20	849·58		
Saharanpore ... 19 Moozufurnugur... 18	843·18		
Saharanpore .. 21 Moozufurnugur... 16	837·25		

Saharanpore to Allyghur.

	Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
	Deoban B. M. ...	831·94	...	Stone B. M. is imbedded on the west side, at the junction of the roads from Bijnour and Meerut to Deoban.
On the road from Saharanpore to Meerut.	Mile-stone.			
	Saharanpore ... 22, Moozufurnugur 15	837·08	...	Top of stone.
	Saharanpore ... 24, Moozufurnugur 13	836·26		
	Saharanpore ... 25, Moozufurnugur 12	829·14		
	Moozufurnugur 9th	825·32		
	" 8th	824·11		
	" 7th	822·35		
	" 6th	822·07		
	" 5th	818·78		
	" 4th	796·87	...	At Rampoor village: Top of stone.
	" 3rd	804·47	...	Top of stone.
	" 2nd	810·68		
	" 1st	807·52		
	Moozufurnugur B. M. ...	790·01	...	Stone B. M. is imbedded on the north side of the Post Office, and near the General Milepost.
On the high road from Moozufurnugur to Meerut.	Moozufurnugur... 1st	805·86	...	Top of stone.
	" ... 2nd	801·83		
	" ... 3rd	801·97		
	Parapet of Syphon Bridge	801·14	...	Over a branch of the Ganges Canal.
	Moozufurnugur... 4th	797·95	...	Top of stone.
	" ... 5th	793·36		
	" ... 6th	783·33	...	Plinth of stone.
	Begarazpur T. S. ... Lat. 29° 22′ 35″ ... Long. 77° 44′ 32″ ... (Of the Great Arc Series.)	815·94	...	*Ground Level Markstone.*—The tower is 50 feet high, and stands on the summit of a sand mound close to the high road.
	Mile-stone.			
	Moozufurnugur 7th	795·48	...	Top of stone.
	" 8th	791·59		
	" 9th	792·09		
	Top of Syphon Bridge	792·05	...	Over a branch of the canal.
	Moozufurnugur 10th	791·25	...	Top of stone.
	Kirnee Bridge ...	791·72	...	Parapet of a bridge over a rajbaha near the Kirnee chowky.
	Moozufurnugur 11th	785·35	...	Top of stone.
	" 12th	785·66		

Saharanpore to Allyghur.

	Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
	Kutowlee B. M. ...	789·82	...	Stone B. M. is imbedded near the bridge of that name, on the left bank of the Ganges Canal, to the south-west of the Meerut and Roorkee Road.
	Ganges Canal Milestone No. 62.	787·05	...	*Plinth of Stone.*—The top of the stone is 1·25 feet above the plinth.
On the high road from Moozufurnugur to Meerut.	Milestone.			
	Moozufurnugur 13th	780·05		
	" 14th	777·36	...	Top of stone.
	" 15th	775·72		
	Top of Syphon Bridge.	775·28	...	Over a branch of the Canal.
	Moozufurnugur 17th	768·84	...	Top of stone.
	Parapet of bridge ...	775·34	...	Over a branch of the Canal, 15½ miles from Meerut.
	Meerut ... 15th	772·20		
	" ... 14th	770·00		
	" ... 13th	766·20	...	Top of stone.
	" ... 12th	762·60		
	" ... 11th	761·43		
	Syphon Bridge ...	757·89	...	Over a branch of the Canal, between the 9th and 10th milestones from Meerut; parapet of drain bridge.
	Dhaorara Chowky ..	753·25		
	Meerut ... 8th	754·80		
	" ... 7th	753·38		
	" ... 6th	750·18		
	" ... 2nd	741·08		
	Meerut B. M.	734·46	...	No. 1 stone B. M. is imbedded in the north-west corner of the Church yard.
	Meerut B. M.	735·47	...	No. 2 stone B. M. is imbedded in the Church yard, near the western wall, by the entrance.
	Meerut Church	739·30	...	A cross mark on the surface of the stone slab opposite the north pillar of the central west door-way.

Saharanpore to Allyghur.

Names of Stations.		Mile-stone.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
On the Grand Trunk Road between Meerut and Allyghur.	Meerut ... 1 / Allahabad ... 389		733·35	...	Top of stone.
	Meerut ... 2 / Allahabad ... 388		735·49		
	Meerut ... 3 / Allahabad ... 387		733·62		
	Meerut ... 4 / Allahabad ... 386		732·79		
	Meerut ... 5 / Allahabad ... 385		730·25		
	Meerut ... 6 / Allahabad ... 384		729·03	...	Surface of plinth or masonry block, in which the stone is imbedded.
	Meerut ... 7 / Allahabad ... 383		724·59	...	Top of stone.
	Meerut ... 8 / Allahabad ... 382		722·04		
	Meerut ... 9 / Allahabad ... 381		721·53		
	Meerut ... 10 / Allahabad ... 380		720·93		
Kharkhaoda B. M.			713·51	...	Stone B. M. is imbedded in the south-east corner of the encamping ground near the bardashtkhana.
On the G. T. Road between Meerut and Allyghur.	Meerut ... 11 / Allahabad ... 379		719·95	...	Top of stone.
	Meerut ... 12 / Allahabad ... 378		715·52		
	Meerut ... 13 / Allahabad ... 377		711·05		
	Meerut ... 14 / Allahabad ... 376		710·49		
	Meerut ... 15 / Allahabad ... 375		708·38		
	Meerut ... 16 / Allahabad ... 374		706·21		
	Meerut . 17 / Allahabad ... 373		701·23		
	Meerut ... 18 / Allahabad ... 372		705·30		
Hauper B. M. ...			692·94	...	Stone B. M. is imbedded at the encamping ground on the south-west side of the road.

Saharanpore to Allyghur.

Names of Stations.		Mile-stone.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
On the G. T. Road between Meerut and Allyghur.	Meerut Allahabad	... 19 ... 371	699·56	...	Surface of plinth.
	Meerut Allahabad	... 20 ... 370	696·92	...	Top of stone.
	Meerut Allahabad	... 21 ... 369	695·12		
	Meerut Allahabad	... 23 ... 367	691·25	...	Surface of plinth.
	Meerut Allahabad	... 24 ... 366	693·44	...	Top of stone.
	Meerut Allahabad	... 25 ... 365	687·30		
	Meerut Allahabad	... 26 ... 364	690·40		
	Meerut Allahabad	... 27 ... 363	690·10		
Galaoli B. M.		... ...	680·52	...	Stone B. M. is imbedded at the encamping ground, on the south-west side of the road opposite the Thana.
On the G. T. Road between Meerut and Allyghur.	Meerut Allahabad	... 28 ... 362	688·71	...	Top of stone.
	Meerut Allahabad	... 29 ... 361	686·62		
	Meerut Allahabad	... 30 ... 360	687·46		
	Meerut Allahabad	... 31 ... 359	685·29		
	Meerut Allahabad	... 32 ... 358	683·06		
	Meerut Allahabad	... 33 .. 357	681·38		
	Meerut Allahabad	... 34 ... 356	678·71		
	Meerut Allahabad	... 35 ... 355	675·67		
	Meerut Allahabad	... 36 ... 354	673·77		
	Meerut Allahabad	... 37 ... 353	669·95		
	Meerut Allahabad	... 38 ... 352	672·43		
	Meerut Allahabad	... 39 ... 351	672·38		
	Meerut Allahabad	... 40 ... 350	669·97		

Saharanpore to Allyghur.

Names of Stations.		Mile-stone.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
	Secunderabad ...	8	667·00	...	On the Boolundshuhr and Delhi road. Top of stone.
	Boolundshuhr ...	0			
	Meerut ...	41	669·15	...	On the Grand Trunk Road. Top of stone.
	Allahabad ...	349			
	Meerut ...	42	670·73		
	Allahabad ..	348			
	Walipoor Bridge ...		673·71	...	Over the Ganges Canal. Plinth of south-south-west pillar; or level of spring of arches.
	Walipoor B. M. ...		670·78	...	Stone B. M. is imbedded in front of the Toll Office, (a small building on the right of the south-west approach to the bridge,) about a yard from the southernmost pillar of the verandah.
On the G. T. Road between Meerut and Allyghur.	Boolundshuhr T. S. ... Lat. 28° 24′ 16″. Long. 77° 54′ 15″. (Of the Great Arc Series.)		727·15	...	*Ground Level Markstone.*—" This station is " on the vaulted roof of an old mosque upon " the highest part of an elevated mound " within the city. Through the centre " dome an aperture was cut, and a central " stone with a dot on brass sunk on a level " with the ground floor."
	Meerut ...	43	672·80	..	Top of stone.
	Allahabad ...	347			
	Meerut ...	44	667·24		
	Allahabad ...	346			
	Meerut ...	45	664·03		
	Allahabad ...	345			
	Meerut ...	46	669·55		
	Allahabad ...	344			
	Meerut ...	47	659·11		
	Allahabad ...	343			
	Meerut ...	48	656·67		
	Allahabad ...	342			
	Meerut ...	49	656·17		
	Allahabad ...	341			
	Meerut ...	50	653·56		
	Allahabad ...	340			
	Meerut ...	51	652·61		
	Allahabad ...	339			
	Meerut ...	52	651·01		
	Allahabad ...	338			
	Meerut ...	53	655·16		
	Allahabad ...	337			

Saharanpore to Allyghur.

Names of Stations.		Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Khoorjah B. M.		647·76	...	Stone B. M. is imbedded on the west side of the road opposite to the dâk bungalow, about 10 chains north of the junction of the roads from Delhi and Meerut to Agra.
On the Grand Trunk Road between Boolundshuhr and Allyghur	Mile. Delhi ... 52, Allahabad ... 336	648·47	...	Top of post.
	Delhi ... 53, Allahabad ... 335	652·43		
	Delhi ... 54, Allahabad ... 334	648·40		
	Delhi ... 55, Allahabad ... 333	645·86		
	Delhi ... 56, Allahabad ... 332	643·87		
	Delhi ... 57, Allahabad ... 331	639·24		
	Delhi ... 58, Allahabad ... 330	638·01		
	Delhi ... 59, Allahabad ... 329	640·53	...	Top of stone.
	Delhi ... 60, Allahabad ... 328	639·63	...	Top of post.
	Delhi ... 61, Allahabad ... 327	643·44	...	Top of stone.
	Delhi .. 62, Allahabad ... 326	636·24		
	Delhi ... 63, Allahabad ... 325	636·00	...	Top of post.
E. I. Railway B M. ...		628·98	...	Top of masonry pillar in the centre of the Railway embankment 2,000 feet north-west of the Somna Station.
Somna B. M.		622·31	...	Stone B. M. is imbedded in the encamping ground near the paka well and close to the south-east boundary pillar.
Delhi ... ... 65, Allahabad 323	Mile post.	632·19	...	Top of post.
Delhi ... ... 66, Allahabad 322	Mile stone.	626·31	...	Top of stone.

Saharanpore to Allyghur.

Names of Stations.		Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
E. I Railway, B. M. ...		624·76	...	A wooden peg in a masonry pillar in the centre of the embankment, 50 yards north of Kanowe Deota road level crossing.
E. I. Railway Pillar ...		622·75	...	Top of kunkur-built pillar on the embankment.
On the G. T. Road between Boolundshuhr and Allyghur.	Mile. Delhi ... 68, Allahabad ... 320	624·18	...	Top of stone (or post ?).
	Delhi ... 69, Allahabad ... 319	624·17	...	Surface of plinth or masonry block.
	Delhi ... 70, Allahabad ... 318	622·79	...	Top of post.
	Delhi ... 71, Allahabad ... 317	621·34	...	Top of stone.
	Delhi ... 72, Allahabad ... 316	622·45		
	Delhi ... 73, Allahabad ... 315	622·26		
	Delhi ... 74, Allahabad ... 314	621·97	...	Top of post.
	Delhi ... 75, Allahabad ... 313	617·58	...	Top of stone.
	Delhi ... 76, Allahabad ... 312	612·58	...	Top of post.
	Delhi ... 77, Allahabad ... 311	610·99	...	Top of stone.
	Delhi ... 78, Allahabad ... 310	613·50		
Allyghur		609·89	...	Well in the encamping ground. A circle with the letters "B. M." cut on the outer edge of the surface of the masonry.
Allyghur		610·49	...	A circle with the letters $\frac{\text{"G. T. S."}}{\text{B. M.}}$ cut on the inner circle of masonry of the same well on "the surface of the largest block "of yellow stone."
Allyghur B. M.		605·85	...	Stone B. M. is imbedded on the north-east side of the road opposite the bardashtkhana of the encamping ground.

SECTION XII.

Allyghur to Sironj viâ Dholepoor, Gwalior, and Sipri.

From a Bench Mark, imbedded in the Allyghur encamping ground, to Agra Cantonment Church, the levels are carried along the high road by Sasni, Hatras, and Khandaoli, connecting in their course the Railway B. M. at Allyghur Engine-house, and the platform of the Goods Station at the Agra terminus.

From Agra the levels proceed along the Bombay road, crossing the Chambal where the road approaches are being excavated, connecting Colonel Sanders' Monument at Maharajpoor, and fixing a Bench Mark imbedded at the base of the old Residency Flag Staff in Gwalior.

Passing through the Lashkar or new City of Gwalior, the levels again strike the great road, and ascend the plateau of Central India, proceeding viâ Mohona, Sipri Cantonment, and Kolarus to Badurwas; whence they are carried to the south-west limit of the base line measured in the Sironj Valley, by way of Naia Serai, Shadaora, Kachnar Serai, and Surental, the last a principal Station of the Great Arc Series.

Allyghur to Sironj.

	Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
On the Grand Trunk Road between Allyghur and Agra.	Allyghur B. M. ...	605·85	...	Vide page 123.
	E. I. Railway B. M....	608·75	...	Platform of the Engine-house at the Allyghur Railway Station. It is about 2 feet above the level of the surrounding ground, and is defined by Mr. Shaw, District Engineer, as being "101·00 on the Delhi District datum."
	Mile-stone. 2nd from Allyghur...	602·45	...	Surface of plinth or masonry block in which the stone is imbedded.
	4th " " ...	602·41		
	B. M. ...	602·57	...	Stone B. M. imbedded 200 feet east of the road, one mile and three-quarters north of a most conspicuous bungalow owned by Mr. Nickterlein.
	Mile-stone. 9th from Allyghur...	596·52	...	Surface of plinth.
	10th " " ...	592·39		
	11th " " ...	593·87		
	12th " " ...	589·93		
	Sasni B. M. ...	589·20	...	Stone B. M. imbedded on the east side of the road in the ruined enclosure called Naokabagh, 1,100 yards north of Sasni.
	Mile-stone. 13th from Allyghur ...	587·08	...	Surface of plinth.
	14th " " ..	591·39		
	15th " " ...	587·99		
	17th " " ...	588·04		
	Mahadeo's Temple ...	581·40	...	Surface of plinth at the north corner of the Court surrounding a temple, built by Sid Gopal, to the east of the road.
	Mile-stone. 19th from Allyghur ...	584·04	...	Surface of plinth.
	Hatras B. M. ...	586·01	...	Stone B. M. imbedded on the east side of the road, about 100 yards south of the 20th milestone from Allyghur.

Allyghur to Sironj.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
On the Grand Trunk Road between Allyghur and Agra.			
Milestone.			
23rd from Allyghur ..	578·97		
24th " " ...	576·88	...	Surface of plinth.
25th " " ...	580·02		
26th " " ...	575·40		
Kewulguri B. M. ...	575·17	...	Stone B. M. imbedded about 30 yards to the west of the 26th milestone from Allyghur.
Milestone.			
28th from Allyghur ...	574·41		
30th " " ...	567·55		
32nd " " ...	562·18	...	Surface of plinth.
33rd " " ...	561·06		
Jowahirgurh B. M. ...	565·89	...	Stone B. M. imbedded on the east side of the road, in front of Mr. Sanders' Indigo Factory, on a small mound a few yards south of the Vats.
Milestone.			
34th from Allyghur ...	563·88	...	Surface of plinth.
37th " " ...	557·51	...	Top of stone.
40th " " ...	559·67		
Khandaoli B. M. ...	554·90		Stone B. M. imbedded about 3 feet north of the south-eastern boundary pillar of the encamping ground.
Milestone.			
43rd from Allyghur ..	554·52		
44th " " ...	556·44		
45th " " ...	550·13	...	Surface of plinth.
46th " " ...	551·75		
Nandlalpore B. M. ...	544·01	...	Stone B. M. imbedded on high ground about 225 yards west of the chowky of that name, which lies between the 47th and 48th milestones.
E. I. Railway B. M....	516·26	...	Surface of platform of "Goods Station" at Agra Railway Terminus, about 4 feet above the rails, designated "reduced level 80·00, Agra District."
Agra Cantonment Church.	553·72	...	Surface of plinth at 9 feet west of the south door in a corner formed by a half pillar with the wall of the building.

Allyghur to Sironj.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Agra B. M.	551·04	...	Stone B. M. imbedded near the north edge of a well in the south-east corner of the Church compound.
On the Agra and Dholepoor Road. Mulpoor B. M. ... Agra District.	546·68	...	Stone B. M. imbedded on the east side of the road, near the 8th milestone from Agra, about 800 yards south of the Mulpoor Thana.
Birai B. M. ... ... Agra District.	549·70	...	Stone B. M. imbedded about 800 yards south-south-east of the village of that name, and about 50 yards to the west of the road.
Seopoor B. M. ... Dholepoor Territory.	558·70	...	Stone B. M. imbedded on the east side of the road, opposite the road chowky of that name, about three miles north of Munia Dâk Bungalow.
For B. M. ... ... Dholepoor Territory.	587·19	...	Stone B. M. imbedded on the west side of a mound through which the roadway has been cut, about four miles north of Dholepoor. A chowky and small road bungalow stand on the east side of the mound.
Dholepoor H. S. ... ... Lat. 26° 39′ 12″. Long. 77° 52′ 2″. (Of the Great Arc Series.) Dholepoor Territory.	939·08	...	*Upper Markstone.*—"This station is situated on the eastern flank of the same "range of hills with Gurja Station, "known by the name of Kalapahar, "which runs east and west along the "northern bank of the Chambal River, "and terminates in low ridges and isolated flats from two and a half to five "miles north-west of the town of Dholepoor. The station will be found on a "conspicuous swell of this mass of hills, "about five miles to the south-west of "the town of Dholepoor, about four miles "south of the Cantonment of the Dholepoor Rana, and about three miles north "of the River Chambal."

Allyghur to Sironj.

	Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
On the Agra and Bombay road between Dholepoor and Gwalior.	Chambal B. M. .. Dholepoor Territory.	397·90	...	Highest point of a low rock on the left bank of the river, near the cause-way leading down the bank to the water's edge. This point is about 2 feet above the winter level of the Chambal river, and was left for the service of the Agra and Bombay road.
	Chola Serai B. M. ... Sindhia's Territory.	566·81	...	Stone B. M. imbedded about 50 feet east of the road, where it turns and descends to the Chambal. Chola Serai lies about a mile further southwards.
	Jora B. M. ... Sindhia's Territory.	573·45	...	Stone B. M. imbedded about 50 feet to the west of a Peepul tree under which stands the Peepulwali Chowky in the lands of Jora village.
	Colonel Sanders' Monument.	581·30	...	Surface of the east and upper corner of the pediment of a monument erected at Maharajpoor in memory of Colonel Sanders, Bengal Engineers.
	Noorabad B. M. ... Sindhia's Territory.	587·91	...	Stone B. M. imbedded on the west side of the road in front of the bungalow.
	Gwalior Residency B. M. Sindhia's Territory.	680·81	...	Stone B. M. imbedded close to and south of the masonry circle supporting the Flagstaff at Gwalior old Residency, about four miles north of the town.
On the Agra and Bombay road between Gwalior and Badurwas.	Gokulpoor B. M. ... Sindhia's Territory.	814·36	...	Stone B. M. imbedded on a knoll to the east of the road, about 130 yards north-north-east of the small village of that name, which lies on the other side of the road.
	Bela ki baoli Bridge	888·96	...	Floor of the centre opening of seven, in the parapet on the east side.
	Paniar B. M. ... Sindhia's Territory.	947·83	...	Stone B. M. imbedded on a small mound 50 yards east of the road in front of Thakoor Futteh Singh's garden.
	Ghati D. B. ...	1,135·66	...	Surface of foundation plinth outside and below the triple pillar at the south-east corner of the verandah.
	Sirsawa B. M. ... Sindhia's Territory.	1,112·33	...	Stone B. M. imbedded 20 yards east of the road, and 90 east of a small bungalow near the village.

Allyghur to Sironj.

	Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
On the Agra and Bombay road between Gwalior and Badurwas.	Saunk Bridge ..	1,096·57	...	Surface of the north-east corner of the coping at the end of the parapet, of the northern of two bridges over the Saunk water-course.
	Deyrar B. M. .. Sindhia's Territory.	1,080·35	...	Stone B. M. imbedded on the west side of the road, 160 yards north-west of a dâk chowky which lies a mile and a half south-east by east of the large village of Seysari.
	Mohonia D. B. ...	1,019·71	...	The 3rd step of the north flight, leading into the verandah of the bungalow.
	Mohonia Bridge ...	1,016·58	...	Surface of the abutment at its junction with the extrados of the southernmost arch on the west side.
	Bhangurh B. M. ... Sindhia's Territory.	1,109·58	...	Stone B. M. imbedded 100 yards west of the road; about midway between the Bhangurh and Bhainswara chowkies.
	Gharaghat B. M. .. Sindhia's Territory.	1,143 23	...	Stone B. M. imbedded on a knoll just outside the hedge surrounding the dâk bungalow, and to the north of it.
	Satambara B. M. ... Sindhia's Territory.	1,337·77	...	Stone B. M. imbedded on high ground about 150 yards west of the road. The village lies about half a mile to the north-east.
	Memoni Bridge ...	1,309·41	...	Floor of the centre opening of seven, in the western parapet, or level of the bridge floor over the key-stone of the central arch.
	Chota Nohrie Bridge	1,512·96	...	Western pier head 3rd of 4 from north to south. About 4 miles from Sipri.
	Sipri B. M. ... Sindhia's Territory.	1,515·54	...	Stone B. M. imbedded in the north-east corner of the dâk bugalow compound, a few yards off the road.

Allyghur to Sironj.

	Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
On the Agra and Bombay road between Gwalior and Badurwas.	Seysai Bridge ...	1,464·26	...	Western pier head 6th of 10 from north to south.
	Kolarus B. M. ... Sindhia's Territory.	1,518·50	...	Stone B. M. imbedded near the Makhoond Imli Chowky, on a ridge 2 miles north of Kolarus town.
	Kolarus Well ...	1,449·42	...	Inner edge of the 6th step below the top of the eastern stairs. This is a fine stone well on the east side of the road, about 200 yards north of the nullah.
	Lakwasa B. M. ... Sindhia's Territory.	1,501·50	...	Stone B. M. imbedded about 150 yards west of the road, on a ridge to the north of the village.
	Lakwasa Bridge ...	1,461·26	...	Beading over the key-stone on the east side of the first bridge south of the village.
	Badurwas B. M. ... Sindhia's Territory.	1,492·25	...	Stone B. M. imbedded about 200 yards north of the dâk bungalow.
On the road from Badurwas to Sironj.	Doongasra B. M. ... Sindhia's Territory.	1,541·13	...	Stone B. M. imbedded in that portion of the lands of Doongasra, known as Doondi Imli, one mile west-south-west of that village.
	Miapoor B. M. ... Sindhia's Territory.	1,597·80	...	Stone B. M. imbedded by the way side about half a mile south-west of the hamlet of that name, and 5½ miles north of Shadaora.
	Kakurwa B. M. ... Sindhia's Territory.	1,736·42	...	Stone B. M. imbedded on a ridge about a mile south-south-east of the hamlet and half a mile north-east of an old tank called "Nakatalao," from which the ridge takes its name, and 6½ miles north of Kuchnar Serai.
	Mohasa B. M. ... Sindhia's Territory.	1,739·47	...	Stone B. M. imbedded about 30 yards north-west of the hamlet of that name, in the Jagir of Inami Sahib of Aroon, 5 miles north of Mogul Serai. This mark is covered with a cairn of stones.

Allyghur to Sironj.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Surental H. S. ... Lat. 24° 14′ 21″. Long. 77° 43′ 14″. (Of the Great Arc Series.) Tonk Territory.	1,802·19	...	*Upper Markstone* —Is on an extensive range of flat hills running north and south, and apparently connected with that of Kalianpur. The station is on the highest swell and derives its name from the village of Surental, which lies about 2 miles to the north-north-east. Bemakheri to the south-west is distant about 1½ miles, and Sorokho to the south-south-west about 2 miles.
S. W. End Sironj ... Base Line Lat. 24° 4′ 47″. Long. 77° 47′ 56″. Tonk Territory.	1,531·36	...	*Upper Markstone.*—This is one of the limits of the base line measured by Col. Everest in 1837-38. It is situated in the cultivated lands of Parsora village, Pergunnah Sironj. The village of Rusali lies to the north-north-west 3·5 miles, Eklaod and Kachpura north-east 3 miles, Baniadhana and Ekodia south-east 1·3 miles, Bamankheri north-west 1·2 miles, and Parsora west 1·1 mile.

SECTION XIII.

Great Arc Meridional Triangulation.

This triangulation comprises the Northern Section of the Meridional Arc measured by Colonel Everest.

The leveling operations have formed a connexion with the East end Dehra Doon base line, the South end Sironj base line, and the trigonometrical stations of Begarazpur, Boolandshuhr, Dholepoor, and Surental; the herein given heights of these stations are the leveled values, to which all other heights are referred, the intermediate errors of the vertical triangulation being corrected by proportion.

Great Arc Meridional Triangulation, from Sironj to Dehra.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	Remarks and Descriptions of Stations.
S. W. End Base ... Lat. 24° 4′ 47″. Long. 77° 47′ 43″. Tonk Territory.	1,531·36	...	*Upper Markstone.*—This point denotes the south-west extremity of the Base Line measured in the Pergunnah of Sironj in 1837-38, and lies in the cultivated land of Parora village. The village of Rusali lies to north-north-west 3·5 miles, Eklaod and Kachpura to the north-east 3 miles, Bania-dhana and Ekodia to the south-east 1·3 miles, Baman-kheri to the north-west 1·2 miles, and Parsora to the west 1·1 mile.
Surental H. S. .. Lat. 24° 14′ 21″. Long. 77° 43′ 11″. Sironj District.	1,802·19	...	*Upper Markstone.*—Is on an extensive range of flat hills running north and south, and apparently connected with that of Kalianpoor. The station is on the highest swell of the hill, and derives its name from the village of Surental, which lies about 2 miles to the north-north-east, Bemakheri to the south-west, about 1¼ miles, and Sorokho to the south-south-west about 2 miles.
N. E. End Base ... Lat. 24° 8′ 54″. Long. 77° 53′ 8″. Tonk Territory.	...	1,481·0	*Upper Markstone.*—This station defines the north-east extremity of the Base Line measured in 1837-38 in the Pergunnah of Sironj. It is situated in the cultivated lands of the village of Rajpur, which is distant from the station 0·7 mile to the west. The village of Tal Barodia lies 1·5 miles to the north-east, Thanarpoor andBinchakheri to the east-south-east, 1·2 miles, and Sialpur to the south 1·7 miles.
Kamkhera H. S. ... Lat. 23° 59′ 46″. Long. 77° 45′ 34″. Tonk Territory.	...	1,780·1	*Upper Markstone.*—The station in which this mark is placed will be found on the eastern extremity of the elevated lands lying about 1½ miles to the east of Kamkhera and about 2 miles to the south of Ladhora, north of Kua about 2 miles, and north-west of Imlani 2 miles.

Great Arc Meridional Triangulation, from Sironj to Dehra.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Bhaorasa H. S. ... Lat. 24° 8′ 4″. Long. 78° 3′ 8″. Gwalior Territory.	...	1,387·3	*Upper Markstone.*—Is on a low ridge of sandstone, and is a place well known in the neighbourhood as having been the site of an ancient city, but which is now a complete heap of ruins; the east part of the hill, however, though very poorly inhabited, still retains the name. There are several small villages in the vicinity of this station. Bherkheri to the north-west about 2 miles, Kiria to the north-east about 2 miles, Salitra to the south-south-west about 2 miles, and Sarkandi to the west about 2 miles.
Kalianpoor H. S. Observatory. Lat. 29° 30′ 55″. Long. 77° 41′ 33″. Sironj District.	...	1,765·1	*Upper Markstone.*—This point is within the observatory built for taking celestial observations.
Pardho H. S. ... Lat. 24° 16′ 18″. Long. 77° 48′ 41″. Gwalior Territory.	...	1,762·9	*Upper Markstone.*—This station is on a range of flat hills lying about 2 miles north of the village of that name, and about 2 miles north of Sungai, and apparently on the same ridge on which Kalianpur and Surantal are situated.
Handiaparo H. S. ... Lat. 24° 25′ 59″. Long. 78° 2′ 32″. Gwalior Territory.	...	1,663·3	This station is on a long range of flat hills or table lands running north and south-and connected with the high lands of Pardho and Surantal in a south-westerly diiection, and with the Chenderi flats in a north-easterly direction. There are several villages around this hill, viz., Jaklon and Nandenkhera to the east about 2 miles, Bherkheri to the south-east about 3 miles, Jaroli to the south south-east about 2½ miles, Harokheri south about 3 miles, Thamasa and Khar to the west about 2 miles, and Bhansakhera to the north-north-west about 3 miles.

Great Arc Meridional Triangulation, from Seronj to Dehra.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Deadheri H. S. ... Lat. 24° 38′ 18″. Long. 77° 42′ 17″. Gwalior Territory.	...	1,867·2	*Upper Markstone.*—Is on a low detached hill about 4 miles north-east of the town of Shadaora and about 6½ miles north-west of the large village and Fort of Puchar. The village from which the station takes its name is on the eastern brow, and well known in the neighbourhood as being the residence of a Mohant and a horde of Saniasis. There are several large tamarind trees on the top of this hill. The station is situated a few hundred yards south-west of the Mohant's building.
Hatiapahar S. ... Lat. 24° 48′ 47″. Long. 77° 56′ 56″. Gwalior Territory.	...	1,788·9	*Upper Markstone.*—This station is on a commanding eminence, which rises above the high lands or ridge of flat hills lying about 2 miles south-west of Isagarh. The village of Piproda lies to the north about 2 miles, Jamdela to the south-east about 3 miles, Amjera to the south about 2 miles, and Dhakoni, a large village to the south-west,about5 miles.
Pahargurh H. S. Lat. 24° 56′ 7″. Long. 77° 44′ 14″. Gwalior Territory.	...	1,641·3	*Upper Markstone.*—This station is on the highest point of a flat sandstone ridge to the north-west of the village of Barodia about a mile, south-west of Piront 2 miles, and about a mile south-east of Mangrora. The station derives its name from a ruined village at the south-east extremity of this flat.
Bherkheri H. S. .. Lat. 24° 57′ 37″. Long. 77° 28′ 57″. Gwalior Territory.	...	1,711·3	*Upper Markstone.*—This station is on the highest point of a low mass of hills about 3 miles south-west of the village of Chandona and about 4 miles south of the Fortress of Bijrawan, and derives its name from a ruined village about one mile south-east of the station.

Great Arc Meridional Triangulation, from Sironj to Dehra.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Nimdant H. S. ... Lat. 25° 2′ 34″. Long. 77° 54′ 51″. Gwalior Territory.	...	1,673·3	*Upper Markstone.*—This station will be found on the eastern extremity of a range of flat topped hills running south-westerly and about two miles south of the well known fort and town of Ranod, sometimes called Narod. The village of Bada Paharo is on the east about one and a half miles; Chota Paharo on the south-east about one and a half miles; Sakrera on the south-south-east about three miles; Bedmao on the south above one and a half miles; and Karila on the north-north-west about half a mile. The road leading to the station was cut and cleared of impediments on the north side.
Gugubara H. S. ... Lat. 25° 12′ 1″. Long. 77° 37′ 4″. Gwalior Territory.	...	1,614·3	*Upper Markstone.*—The situation of this station is on a low flat range of sandstone, about two and a half miles south-west of the large fortified town of Kolarus, two and a half miles north of the hill fort of Ukawal, and three miles east of that of Rai. Its name is that of a village formerly occupying the summit, in the midst of the ruins of which the station is selected.
Mao H. S. ... Lat. 25° 16′ 54″. Long. 77° 55′ 42″. Jhansi District.	...	1,593·5	*Upper Markstone.*—This station will be found on a detached flat topped hill about a mile to the east of the small village of Mao. The fort and town of Kenwai lie to the north-west about three miles; Kundulpur fort, situated on the ridge to the west, about two miles; and Machmor to the south about three miles.
Memoni H. S. ... Lat. 25° 31′ 29″. Long. 77° 44′ 5″. Gwalior Territory.	...	1,595·8	*Upper Markstone.*—This station is situated on an eminent point in the eastern border of an extensive table-land, in which the river Parbati takes its rise. The village of Memoni, now nearly deserted, is about two miles south. The cantonment of Sipri is distant about seven miles in the same direction.

Great Arc Meridional Triangulation, from Sironj to Dehra.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Shergurh H. S. ... Lat. 25° 35′ 25″. Long. 77° 57′ 43″. Gwalior Territory.	...	1,480·4	*Upper Markstone.*—Situated on a lofty isolated hill of sandstone, being an outlier of the Bindrachel range, which runs a little to the west. The ruined fort and village of Shergarh lie two miles north in the plains; Narwar is north and four miles distant.
Kasri H S. ... Lat. 25° 46′ 36″. Long. 77° 43′ 16″. Gwalior Territory.	...	1,486·6	*Upper Markstone.*—Is on an eminent part of the range, which forms the southern boundary of the valley of the Parbati. It is called after a ruined village about one and a half miles south. The large village of Gopalpur is about four and three-quarters of a mile south-west. The upper road from Gwalior viâ Sipri to the Dekhan runs through this village and skirts the Kasri hill.
Dhobai H. S. Lat. 25° 55′ 48″. Long. 78° 2′ 18″. Gwalior Territory.	...	1,309·4	*Upper Markstone.*—The situation of this station is on the eastern edge of the Bindrachel range; Dhobai village is in the plain, about one and a half miles south-east; Karaya 4·1 miles south-south-east. The village of Dhobai is on the high road between Gwalior and Narwar.
Raipoor H. S. ... Lat. 26° 8′ 15″. Long. 78° 7′ 16″. Gwalior Territory.	...	1,217·2	*Upper Markstone.*—Has its situation on a lofty conical peak surmounted by a Hindoo temple, and is in the vicinity of Gwalior, from which it is distant about nine and a half miles south-west, and from the village of Raipoor one and a half miles south-west.
Den H. S. ... Lat. 26° 1′ 9″. Long. 77° 51′ 22″. Gwalior Territory.	...	1,419·8	*Upper Markstone.*—Is situated on a lofty detached hill of sandstone, capped with a mass of iron clay about 150 feet thick, from which the village of Den is distant one and a half miles north-east and the fort of Rent about two and a half miles south-east. The town of Doa is six and a half miles north-east. The Den hill is locally called Daotora.

Great Arc Meridional Triangulation, from Sironj to Dehra.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Chilwani H. S. ... Lat. 25° 57′ 57″. Long. 77° 34′ 2″. Gwalior Territory.	...	1,353·0	*Upper Markstone.*—Is on the highest point of an extensive ridge of flat land, having the village from which it derives its name about three quarters of a mile to the north, and Dongarpur about a mile to the south. Water is here very scarce, there being only a small well and nala about a mile to the north-west of the station.
Juktipura H. S. ... Lat. 26° 12′ 3″. Long. 77° 30′ 46″. Gwalior Territory.	...	1,184·7	*Upper Markstone.*—This station is on the eastern extremity of a range of flat hills running north-east and south-west, known by the name of the Sabalgarh range. The small village of Juktipara, after which the station is named, is to the west about a mile. The fortress and town of Sabalgarh is to the north-north-west about six miles; Jelalpur is to the south-east about a mile; and Tailori is to the south-west about a mile. The ascent to the summit is on the eastern side, where a road has been partially cut.
Pagaro H. S. ... Lat. 26° 16′ 14″. Long. 77° 53′ 39″. Gwalior Territory.	...	1,122·1	*Upper Markstone.*—Is on the highest point of a cluster of bluff peaks; on the wertern brow of that selected lies the small village of Pagaro, from which the station is named. There is a high temple adjoining the platform on the north-north-eastern side, dedicated to Koradeo; the village of Doraro is about a mile to the north-west, Basai is about three miles to the south-west. The ascent is on the south-western side, rugged and steep, and not traced in the usual manner.

Great Arc Meridional Triangulation, from Sironj to Dehra.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Gurjapahar S. ... Lat. 26° 21′ 34″. Long. 77° 35′ 37″. Dholepoor District.	...	1,170·8	*Upper Markstone.*—Situated on an extensive range of hills running east and west, which overhangs the Chambal. The small village of Gurja or Sona Gurja, from which the station is named, is distant about three-quarters of a mile north. The villages of Sewar and Pali, immediately on the north bank, lie about three and a half miles south-east of the station; to the west it has the villages of Madurpur, Bejole, Barwai, in the Karoli district. A road has been cut from the village of Guraj to the station.
Dholepoor H. S. ... Lat. 26° 39′ 12″. Long. 77° 52′ 0″. Dholepoor Territory.	939·08	...	*Upper Markstone.*—This station is situated on the eastern flank of the same range of hills with Gurja station, known by the name of Kalapahar, which runs east and west along the northern bank of the Chambal river, and terminates in low ridges and isolated flats from two and a half to five miles north-west of the town of Dholepoor. The station will be found on a conspicuous swell of this mass of hills about five miles to the south-west of the town of Dholepoor, about four miles south of the cantonment of the Dholepoor Rana, and about three miles north of the river Chambal.
Nindhar H. S. ... Lat. 26° 17′ 57″. Long. 77° 13′ 22″. Karoli Territory.	...	1,344·6	*Upper Markstone.*—Situated upon the summit of a high isolated hill of sandstone. The village lies at the north foot of the hill. The river Chambal flows about three miles south, and a lofty range of sandstone passes about six miles to the north, stretching north-east and south-west as far as the eye can reach. Nindhar station is on a detached part of this range; the country round is bleak and barren and much intersected by ravines, which feature is common to all the land bordering on the Chambal. The fort of Mandrel, on the banks of the Chambal, bears three and a quarter miles south-west.

Great Arc Meridional Triangulation, from Sironj to Dehra.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Machi H. S. ... Lat. 26° 33′ 27″. Long. 77° 5′ 36″. Karoli Territory.	...	1,297·0	*Upper Markstone.*—This station is upon a low sandstone ridge forming the north boundary of the Karoli valley. The hill is easy of ascent on the north, but on the south it is precipitous. The country on all sides is bleak and barren, and much intersected with ravines. The town of Karoli lies about eight miles to the south-east of the station.
Dimdimma H. S. ... Lat. 26° 54′ 26″. Long 77° 17′ 35″. Bhartpur Territory.	...	1,214·5	*Upper Markstone.*—Is on a high range of sandstone which terminates about two and a half miles to the east, where at the foot of the hill is situated the town of Beana. The hill fort of Indragarh is on an outlying portion of the range about two miles south. The little village of Dimdimma is north about two miles and in the plains.
Usira H. S. .. Lat. 26° 57′ 7″. Long. 77° 40′ 20″. Agra District.	...	809·8	*Upper Markstone.*—Situated on a shelving range of rocky hills running north-east and south-west. There are several villages to the north and south sides of this range; on the former lies the village of Khand, about two miles north-north-east, Kheri about a mile north-north-west, and Samli about two miles north-west. On the latter lie the village of Usira, close under the station and in a westerly direction, Nagla about a mile to the south, and Pipret about a mile to the south-east.
Madhoni H. S. ... Lat. 27° 13′ 50″. Long. 77° 28′ 8″. Bhartpur Territory.	...	713·7	*Upper Markstone.*—This station is situated on a ridge of sandstone rock four and a quarter miles north-west of the celebrated fortress of Bhartpur. The nearest village is Madhoni.
Alipur H. S. ... Lat. 27° 8′ 38″. Long. 77° 1′ 35″. Bhartpur Territory.	...	1,350·7	*Upper Markstone.*—Has its situation on a high mass of sandstone, known in the locality by the name of Kalapahar. The village of Alipur is at the foot of the hill which has a Hindu temple on the top, forming a very remarkable object when seen from any distance.

Great Arc Meridional Triangulation from Sironj to Dehra.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Rasia H. S. ... Lat. 27° 26′ 18″. Long. 77° 12′ 52″. Bhartpur Territory.	...	1,059·2	*Upper Markstone.*—Stands on a spine of quartz rock about 500 feet high, which rises abruptly in the midst of a vast plain highly cultivated. On the top of the hill is a small Hindu temple, a few yards west of the station. The village of the same name is at the south-west foot of the hill; Kumber, distant 15 miles in a south-east direction, and the fortress of Dig 9·8 miles east-north-east.
Ladpur H. S. ... Lat. 27° 30′ 26″. Long. 76° 51′ 24″. Alwar Territory.	...	134·89	*Upper Markstone.*—Is on a peak of remarkable outline, the ascent to which is very abrupt. The station is named after a village at the northern foot of the village. The hill fortress of Alwar is 14·656 miles north-west, Ramgarh fort 5·1 miles north, and Laswari 7·5 miles north-east.
Chapra H. S. ... Lat. 27° 43′ 58″. Long. 77° 3′ 1″. Gurgaon Territory.	...	1,220·3	*Upper Markstone.*—Stands on a range of hills forming the eastern boundary of the village of Ferozpoor. The village of Chapra is about a mile south-east, in which direction the ascent to the hill is very steep, but from the village of Gato, one mile north of the station, it is more gradual. The town and fort of Ferozpoor lie about four miles in a north-west direction.
Manpoor H. S. ... Lat. 27° 38′ 13″. Long. 77° 24′ 2″. Muttra Territory.	...	827·8	*Upper Markstone.*—Situated on a low sandstone range of hills near the celebrated temples of Barsana and Nandgaon, the former of which lies to the north-east of the station 1·3 miles, and the latter north-east 5·4 miles.
Aring S. ... Lat. 27° 29′ 7″. Long. 77° 34′ 11″. Muttra District.	...	670·5	*Upper Markstone.*—This station is on the vaulted roof of an old castellated building situated within a mud redoubt, 32 feet high above the surface of the mound, which is itself about 25 feet higher than the surrounding country. The village of Aring lies close south to the station, Ral to the north-east 5·5 miles, and Govardhan about four miles west-south-west.

Great Arc Meridional Triangulation from Sironj to Dehra.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Nos. ... Lat. 27° 50′ 54″. Long 77° 41′ 13″. Muttra District.	...	709·8	*Upper Markstone.*—Is situated within a mud redoubt bordering on the low lands of the Jumna. The village of Dhanota is to the north-west of the station eight miles, Mitholi north 6·9 miles, and Mubarakpur to the north-west (or one mile and three quarters.)
Pahera S. ... Lat. 28° 2′ 50″. Long. 77° 19′ 50″. Gurgaon District.	...	750·3	*Upper Markstone.*—Stands on a very low sandstone rock cropping out of the plains. The village of Gharab is to the south-west of the station 1·1 miles, and Atin west-south-west three miles.
Meoli H. S. ... Lat. 28° 3′ 30″. Long. 76° 59′ 25″. Gurgaon District.	...	1,347·2	*Upper Markstone.*—This station is on a hill having the village of Bai at the foot, but is named after a village about two miles east from the foot of the range. The ascent from Bai is very abrupt and precipitous. To the north of the station about a mile are several domed buildings, belonging to the neighbouring village of Indor, having a fort about half a mile to the north-west.
Chandaos T. S. ... Lat. 28° 5′ 2″. Long. 77° 54′ 7″. Koel District.	...	699·3	*Upper Markstone.*—Is on a high bank of accumulated sand about 400 yards from the village of that name. The village of Umri lies to the south-west of the station 5·9 miles, and Elampur north-west 2·4 miles.
Karol T. S. ... Lat. 28° 10′ 12″. Long. 77° 35′ 32″. Boolandshuhr District.	...	733·7	*Upper Markstone.*—Stands on the mound of a ruined redoubt on the high east bank of the Jumna, which flows within a quarter of a mile of it; it is situated in the village of the same name; Jewar lies to the south-south-west of the station 3·2 miles, Begamabad to the north 0·9 miles, Dianatpur to the north-east 1·4 miles, and Chandat to the south-west 6 9 miles.

Great Arc Meridional Triangulation from Sironj to Dehra.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Deri H. S. ... Lat. 28° 24′ 39″. Long. 77° 14′ 46″. Delhi District.	...	1,050·6	*Upper Markstone.*—This station is situated on an extensive flat of sandstone. The small village of Deri is about two miles distant to the north, but there is a Ghosain's math and tank one mile west. The circumadjacent land is stony, bleak and barren. The Kutab lies north-north-west distant 7·9 miles.
Boolandshuhr T. S. .. Lat. 28° 24′ 16″. Long. 77° 54′ 13″. Boolandshuhr District.	741·15	...	*Upper Markstone.*—Fourteen feet above ground level markstone. Is on the vaulted roof of an old mosque upon the highest part of an elevated mound within the city of the same name.
Bostan T. S. ... Lat. 28° 31′ 0″. Long. 77° 33′ 16″. Boolandshuhr District.	...	758·1	*Upper Markstone.*—Stands on the high bank which bounds the bed of the Jumna to the east. To the north-west of the station is the village of Garabpur, distant about 3·9 miles, and Dadri north-east 3·5 miles.
Pir Ghyb S. ... Lat. 28° 40′ 36″. Long. 77° 15′ 19″. Delhi District.	...	832·5	*Upper Markstone.*—Is on the southern dome of a small darga of a Mahomedan Saint of that name standing on a ridge of sandstone which runs north-east and south-west between the cantonments and city of Delhi; Delhi cantonment flag-staff lies north-east 0·8 mile, the Jumma Musjid south-east 2·1, and the Kutab Minar south-south-east 10·6 miles.
Dateri S. ... Lat. 28° 44′ 5″. Long. 77° 41′ 24″. Meerut District.	...	767·0	*Upper Markstone.*—This station is situated about half a mile south-east of the village of that name, 4·6 miles south-east of Kalchina, 5·8 miles north-east of Nal, and about 1·5 miles north-north-west of Pilkna.
Dholri T. S. ... Lat. 28° 55′ 14″. Long. 77° 31′ 15″. Meerut District.	...	780·8	*Upper Markstone.*—Situated on slightly elevated ground near the village of the same name.

Great Arc Meridional Triangulation, from Sironj to Dehra.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Saini T. S. ... Lat. 29° 2′ 21″. Long. 77° 49′ 50″. Meerut District.	...	831·6	*Upper Markstone.*—This station is fixed on a very high mound of mud and broken bricks, probably the remnants of a ruined redoubt, in the midst of the village of that name, and 5·4 miles north-east of Meerut.
Saroli T. S. ... Lat. 29° 9′ 58″. Long. 77° 33′ 48″. Meerut District.	...	819·8	*Upper Markstone.*—Situated 5·9 miles north-west of Sirdhana, south-south-west of the village of Chur 1·5, north-north-east of Goatka 0·7, east of Parsi village 1·6 miles.
Sheopuri T. S. ... Lat. 29° 19′ 0″. Long. 78° 1′ 59″. Saharanpore District.	...	870·7	*Upper Markstone.*—Is on an elevated earthen mound on the high bank which bounds the bed of the Ganges to the western side, apparently the site of a ruined fort. The village of Sheopuri lies to the west about half a mile from the station and Mirapur south-west about three miles.
Begarazpur T. S. ... Lat. 29° 22′ 35″. Long. 77° 44′ 29″. Moozufurnugur District.	865·94	...	*Upper Markstone.*—Fifty feet above ground level markstone. Stands on the summit of one of the sand mounds so common in the Doab, and is close to the high road leading from Meerut to Moozafarnagar, being about six and a half miles from the latter place. The village of Begarazpur lies to the north-west of the station 0·9 mile, Jaroda to the north-north-west 1·8 miles, and Mansurpur to the east 2·8 miles.
Godhna T. S. ... Lat. 29° 37′ 19″. Long. 77° 56′ 30″. Saharanpore District.	...	900·9	*Upper Markstone.*—Is on the high bank which bounds the bed of the Ganges on the west side. The village of Godhna is about a quarter mile to the west of the station, Kajikapur west about four miles, and Thugalpur south about one mile and a quarter.
Dahera T. S. ... Lat. 29° 37′ 40″. Long. 77° 39′ 23″. Moozufurnugur District.	...	893·1	*Upper Markstone.*—This station is situated in the village of the same name, 1·5 miles south-east of the village of Rankanda, 0·5 mile south-west of Kasoli, and 0·9 mile north north-east of Jakwala.

Great Arc Meridional Triangulation, from Sironj to Dehra.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Kaliana Observatory. ... Lat. 29° 30′ 55″. Long. 77° 41′ 33″. Moozufurnugur District.	...	827·5	*Upper Markstone.*—This station is fixed within the observatory erected for the purpose of taking celestial observations. The village of Kacholi is to the north-north-east 0·8 mile, Kasari to the north-north-west 1·8 miles, and Seid Nagla to north-west 0·7 mile.
Nojli T. S. ... Lat. 29° 53′ 28″. Long. 77° 42′ 52″. Saharanpore District.	...	929·4	*Upper Markstone.*—Lies 0·4 mile to the south of the village of that name, one mile south of Punder, and one mile south-west of Barapur.
Dhoiwala H. S. ... Lat. 30° 7′ 13″. Long. 78° 4′ 30″. Dehra Doon District.	...	2,948·8	*Upper Markstone.*—This station is on the middle ridge of the Chati range, which bounds the Doon to the south. The village of Dhoiwala, from which the station is named, is the nearest inhabited spot, being about seven miles distant; Bulawala, a deserted village, is about five miles from the station.
Amsot H. S. ... Lat. 30° 22′ 45″. Long. 77° 43′ 42″. Dehra Doon District.	...	3,139·8	*Upper Markstone.*—Is situated on the highest point of the same range as Dhoiwala. Timli is the nearest village, being about three miles to the north-east.
Banog H. S. ... Lat. 30° 28′ 38″. Long. 78° 3′ 23″. Dehra Doon District.	...	7,432·8	*Upper Markstone.*—Is on a detached peak of the lower range of the Himalaya mountains, about a mile to the north of the range, whereon Masuri, Hatipaon, &c., are situated.
West End Base. ... Lat. 30° 19′ 44″. Long. 77° 54′ 9″. Dehra Doon District.	...	1,771·5	*Upper Markstone.*—This station is about two miles to the east of the small village of Sherpur, and about one mile south from the Asan river, on the sloping land where the Ghati range falls into the valley.
East End Base. ... Lat. 30° 17′ 8″. Long. 78° 0′ 58″. Dehra Doon District.	1,957·65	...	*Upper Markstone.*—Is on one of the spurs of the Ghati range. The Asan river winds round the foot of this spur, and one branch of it rises in a ravine about 100 yards to the westward. The nearest village is Mohobawala about a mile to the eastward.

SECTION XIV.

North-west Himalayan Triangulation.

This Series of Triangles is carried over the lower ranges of the Himalayas, between Dehra Doon and Peshawur. The Leveling Operations have fixed the heights of the Base lines at Dehra and in the Chuch Valley, but no other stations have been connected; consequently the intermediate error generated in the vertical triangulation has been dispersed throughout the Series, by proportion.

North-west Himalayas, between Dehra Doon and Peshawur.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Dhoiwala H. S. ...	...	2,948·8	Vide page 146.
Amsot " ...	...	3,139·8	Vide page 146.
Banog " ...	...	7,432·8	Vide page 146.
Juin H. S. ... Lat. 30° 41′ 44″. Long. 77° 38′ 10″. Sirmoor District.	...	8,492·9	*Upper Markstone.*—This point is on the highest peak of a ridge bearing the same name. A road was cut from Shio, at the junction of the Jalar and Geri, to the station. The pillar is built on a small mound, and is of the usual construction.
Rampoor H. S. ... Lat. 30° 27′ 34″. Long. 77° 23′ 49″. Ambala District.	...	2,171·3	*Upper Markstone.*—This station is situated on the lower range of hills north of a small village after which it is named. A road was cut from the village to ascend the hill. The station is marked by the usual pillar and platform.
Dadu H. S. ... Lat. 30° 38′ 58″. Long. 77° 16′ 25″. Sirmoor District.	...	5,030·1	*Upper Markstone.*—Is situated on the highest point of the ridge four miles north of Nahan, whence there is a high road to Bagtiala, passing half a mile east of the station.
Shi H. S. ... Lat. 30° 51′ 57″. Long. 77° 26′ 34″. Sirmoor District.	...	9,716·9	*Upper Markstone.*—This station is on a low spur running westerly from the Chur Mountain.
Chitan S. ... Lat. 30° 28′ 15″. Long 77° 3′ 59″. Ambala District.	...	1,037·7	*Upper Markstone.*—This station is situated in a field on the south side of the road leading from Shazadpoor towards Ropar, and about a quarter of a mile from a subordinate village of the same name.
Kasaoli H. S. ... Lat. 30° 53′ 13″. Long. 77° 0′ 52″. Pattiala Territory.	...	6,322·0	*Upper Markstone.*—This station is situated on the highest peak in the centre of the Kasaoli Cantonment.

North-west Himalayas, between Dehra Doon and Peshawur.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Nada H. S. ... Lat. 30° 41′ 6″. Long. 76° 56′ 45″. Pattiala Territory.	...	1,576·5	*Upper Markstone.*—Is situated on a part of the low range of sand hills two miles north of Ramgarh, and about one mile east of the village after which it is named. A road was made on the north side of the ridge to ascend the hill from the village.
Baradevi H. S. ... Lat. 31° 11′ 37″. Long. 76° 55′ 38″. Simla District.	...	6,789·3	*Upper Markstone.*—This station is placed on the highest point of the Mountain called Baridhar. There is a travellers' bungalow at Sai-ka-hati at the south-west base of the hill, where several principal roads branch off to Simla, Sabathu, Belaspur, Ramgarh, and Nalagarh. The station may be visited by taking the road to Belaspur as far as the summit of the ridge and then, turning off to the right, ascending the hill by a small road cut to Mathog.
Gocha H. S. ... Lat. 30° 53′ 28″. Long. 76° 45′ 35″. Ambala District.	...	1,571·9	*Upper Markstone.*—The ordinary pillar and platform marking this station are to be found on a small peak of the low hills bounding the Pinjor Doon, about one mile north-east of the village of the same name, from which a road was made to the station.
Nainadevi H. S. ... Lat. 31° 18′ 22″. Long. 76° 34′ 42″. Ambala District.	...	3,894·8	*Upper Markstone.*—This station is built on a rock at the south-east angle of a Pagoda of the same name—a celebrated place of worship, about four miles north of Makaol and Ananpoor, whence a narrow road runs to Kartor to the south-west base of the hill, and stone steps lead up to the station. There is a town containing several hundred houses on the hill, a quarter of a mile south of the Pagoda.

North-west Himalayas, between Dehra Doon and Peshawur.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Baraol H. S. ... Lat. 31° 3′ 5″. Long. 76° 29′ 54″. Hoshiarpur District.	...	1,574·0	*Upper Markstone.*—This station is on a peak of the range of low sand hills on the right bank of the Sutlej. To visit this station it is necessary to repair to Bujrur, on the eastern side of the range, thence by Raipur to ascend a small river to Kotah, within the hills, whence a road is made to the Station.
Maidiwani H. S. ... Lat. 31° 17′ 41″. Long. 76° 14′ 26″. Hoshiarpur District.	...	1,934·9	*Upper Markstone.*—This station is situated on the range of hills seven miles north of Gharshanker, on the road to Hoshiarpur, and one mile west of the village of the same name.
Solasinghi H. S. ... Lat. 31° 37′ 37″. Long. 76° 25′ 3″. Nadown District.	...	3,811·7	*Upper Markstone.*—This station is situated at the south-east end of a remarkable stone fort, crowning the ridge of hills about ten miles south of Nadown, that forms the eastern boundary of the valley of the Soan. The walls of the fort are 4 feet thick and of the best rubble masonry; at the junction of two of these, a small circular pillar is constructed which marks the station. There is a road for horses connecting Una with Nadown, that passes the ridge one mile west of the station at the temple of Chaomukhi, near which is a well known fort of the same name, and thence a path leads up to the fort of Solasinghi. At the south base of the hills there is a beautiful stone tank, and a fine supply of water, whence the road towards Nadown is practicable for camels.
Rahoon H. S. ... Lat. 31° 3′ 12″. Long. 76° 9′ 49″. Jalunder District.	...	929·6	*Upper Markstone.*—The fort in which the station is situated stands in the centre of the town of Rahoon, and is greatly elevated above the surrounding country. The pillar marking the station is built in one of the highest buildings, and is of the usual construction.

North-west Himalayas, between Dehra Doon and Peshawur.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Hiu H. S. Lat. 31° 12′ 31″. Long. 76° 1′ 45″. Jalunder District. ...	...	886·7	*Upper Markstone.*—The village in which this station is situated is on elevated ground, and the pillar marking the station is at the north-east angle. Bangai, the capital of a pergunnah in the district of Jalunder bears south-east from the station and is distant about one and a half miles.
Mangi H. S. Lat. 31° 35′ 14″. Long. 76° 4′ 45″. Hoshiarpur District. ...	...	1,869·6	*Upper Markstone.*—This station is situated on the range of sand hills 12 miles east of Hoshiarpur, whence there is a narrow road practicable for horses, leading to Mangi and thence to Dada, which ascends by a deep ravine or water-course and crosses the hills towards Amb, on a peak on the south side of the ravine and about one mile west of the principal ridge.
Tipri H. S. Lat. 31° 50′ 29″. Long. 76° 6′ 41″. Kangra District. ...	...	3,340·7	*Upper Markstone.*—About two miles north of the temple of Chintpurni, this station is placed on the highest point of the ridge of hills bounding the Soan to the eastward. The station is marked by the usual pillar and platform, and is about one mile south of the village of the same name.
Gumber H. S. Lat. 31° 55′ 18″. Long. 76° 20′ 24″. Kangra District. ...	...	3,720·6	*Upper Markstone.*—This station is on the most remarkable peak at the north end of the Jwala-mukhi range, above the village of Gumber, on the high road from Jwala-mukhi to Kangra. From the village there is a rough circuitous path which ascends the mountain. The Revenue Survey Station called Habraol is on this peak, and it forms with Solasinghi an angle to the right of 25° 16′, and is distant 63·8 feet.
Koti H. S. Lat. 31° 50′ 22″. Long 75° 53′ 22″. Hoshiarpur District. ...	...	2,186·4	*Upper Markstone.*—Is situated at the head of a ravine, about 10 miles south-east of Hajipur, on the low range lying betweeen that place and Hoshiarpur; the village after which it is called is a quarter of a mile north of the station.

North-west Himalayas, between Dehra Doon and Peshawur.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Lepiana H. S. ... Lat. 32° 8′ 54″. Long. 76° 11′ 45″. Kangra District.	...	2,911·0	*Upper Markstone.*—Ten miles north-west of Kangra, on the river Gaj, which pierces the range of hills that runs north-west, is the celebrated hot spring of Tattapani, half a mile from which a large nullah falls into the river, on the right bank. From thence is a made road to ascend the mountain to the north, on the highest peak of which, distant two miles, is the station of Lepiana, marked by a pillar and platform.
Dinalad H. S. ... Lat. 32° 7′ 51″. Long. 75° 53′ 25″. Kangra District.	...	2,069·0	*Upper Markstone.*—This station is situated on the western range of the Himalayas, about seven miles north-east of Mirthal, in the vicinity of two villages of the names of Dina and Ladh. The station is approached by the great ravine running from Deori to Hoara; about two miles south of the latter place a river falls in from the west, and there is a made road across the hills to the station.
Hatidhar. H. S. ... Lat. 32° 21′ 12″. Long. 76° 2′ 52″. Kangra District.	...	5,246·5	*Upper Markstone.*—This station is on the highest point of the rocky range of hills seven miles north-east of Nurpur, on the boundary of the Kangra District, and of the hill State of Chumba. The route from Nurpur is by the high road to Nari, about two miles south of which place a path leads off to Koara, on the Chaki, and thence to a bazar at Jageri, in the bed of the river below the fort of Tarragarh; ascending the river from which place for the distance of about two miles, a road is met with, which ascends the mountain on the eastern face.
Dala H. S. ... Lat. 32° 25′ 51″. Long. 75° 47′ 48″. Kangra District.	...	2,771·9	*Upper Markstone.*—Is on the highest point of the outer range of hills one mile south of the Ravi and about two miles south-east of the village of Phangota, whence a road leads across the hills to Sad, one mile north of the station, and thence to Pathankote.

North-west Himalayas, between Dehra Doon and Peshawur.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Pogansir S. ... Lat. 32° 15′ 23″. Long. 75° 33′ 56″. Deenanagar District.	....	949·8	*Upper Markstone.*—This station is situated in the plains, six miles south of the town of Sujanpore, eight miles north-west of Pathankote, and one mile north of Tergarh. The station on the east bank of the Ravi, and is a little elevated above the surrounding cultivation.
Samnabanj H. S. ... Lat. 32° 43′ 37″. Long. 75° 27′ 42″. Jammoo Territory.	...	7,241·4	*Upper Markstone.*—This station stands in the centre of a remarkable stone tower at the east end of the great mountain range lying between Sumartha and Ramnagar, the path connecting which places passes by the tower.
Ban H. S. ... Lat. 32° 34′ 1″. Long. 75° 13′ 40″. Jammoo Territory.	...	2,243·1	*Upper Markstone*—This station is on the hills one mile north-east of a village of the same name, whence there is a path to ascend to the usual pillar and platform. The station is four miles east of the town of Samba.
Gurhagurh H. S. ... Lat. 32° 38′ 0″. Long. 75° 4′ 33″. Jammoo Territory.	...	2,032·8	*Upper Markstone.*—This station is situated on the outer range of hills about five miles north-west of Samba, 18 east of Jammoo, and two west of the famous temple of Ullarbaini. The village after which the station is named is about two miles south of it, and thence a path is made to ascend the hill.
Shegala H. S. ... Lat. 32° 50′ 14″. Long. 75° 8′ 15″. Jammoo Territory.	...	3,649·0	*Upper Markstone.*—This station is on a continuation of the same range of hills as that on which the station of Samnabanj is situated, and is on the crest of the hill between the large and well known villages of Jindraw and Bareira, the former being in the valley on the south, and the latter in that on the north side of the hill. A rather steep but broad and paved road leads up from the village of Jindraw to a tank which is situated in a pass on the hill, from whence the station is distant about half a mile to the west. A path leads down from the tank to the village of Bareira.

North-west Himalayas, between Dehra Dhoon and Peshawar.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Dehra H. S. ... Lat. 32° 46′ 20″. Long. 74° 40′ 45″. Goozerat District.	...	894·6	*Upper Markstone.*—Is situated on the site of an old village slightly elevated above the surrounding country, about four-tenths of a mile to the north-west of the village of Dehra.
Tarrakote H. S. ... Lat. 33° 0′ 12″. Long. 74° 58′ 19″ Jammoo Territory.	...	3,871·4	*Upper Markstone.*—This station is situated on the summit of a small hill south-west of the high and well known sacred hill called Trikoota, and about eight-tenths of a mile west of the well known bazar of Katra.
Kalidhar H. S. ... Lat. 32° 59′ 39″. Long. 74° 28′ 38″. Jammoo Territory.	...	3,776·1	*Upper Markstone.*—Is on the range of hills of the same name immediately to the east of the gorge through which the The river passes to the plains. The road leading up to the station commences at the village of Nanooa, the path to which from the Naoshera valley passes the villages of Malt Paraor and goes down to the foot of Kulliet.
Choroosira H. S. ... Lat. 33° 16′ 56″. Long. 74° 41′ 48″. Jammoo Territory.	...	7,790·7	*Upper Markstone.*—Is situated on a prominent point of an extensive range of hills immediately south of the Pir Pinjal, and about four miles in a direct distance from the well known village of Khorbani. The road from Sealkote to Kashmere viâ Powni and Boodool passes below the station on the southern side of the hill.
Pir Badesur H. S. ... Lat. 33° 17′ 53″. Long. 74° 11′ 33″. Jammoo Territory.	...	5,431·7	*Upper Markstone.*—This station is situated on the well known hill of the same name. The highest part of the hill is occupied by temples, the jogies in charge of which having objected to allow a station being made near them, it was necessary to put it about three-tenths of a mile to the south of the temples, and 50 or 60 feet lower. The usual pillar and platform mark the station, and the road leading up to them commences at the village of Rajwa, in the Banna Valley.

North-west Himalayas, between Dehra Doon and Peshawur.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Kudiali H. S. ... Lat. 33° 4′ 54″. Long. 74° 5′ 48″. Jammoo Territory.	...	3,549·2	*Upper Markstone.*—This point is situated on the same range as Kalidhar Station. The small village of Kudiali, from which the station takes its name, is about 0·1 mile to the north-east and the town of Bhimbour is at the foot of the range, distant about 10 miles to the south-east.
Kundi H. S. ... Lat. 33° 18′ 34″. Long. 73° 56′ 2″. Jammoo Territory.	...	4,375·4	*Upper Markstone.*—Will be found on the well known hill of the same name. The road leading up to it commences at the village of Amban, which is about two miles to the south-west of the station. From Amban a road fit only for foot passengers leads down to the town of Meerpoor, from which Amban is distant about 12 miles.
Daolatnagar S. ... Lat. 32° 44′ 46″. Long. 74° 7′ 21″. Goozerat District.	...	942·5	*Upper Markstone.*—This station is situated on the north-east corner of the elevated site of an old serai, and to the north of the large village after which it is named. It is about 13 miles north-east of the city of Goozerat.
Jogi Tila H. S. ... Lat. 32° 51′ 34″. Long. 73° 28′ 51″. Jhelum District.	...	3,200·3	*Upper Markstone.*—Is situated on the well known hill of that name, about 100 yards south-east of the large temple, and nearly the same distance east of the small one. Both the temples are on higher ground than the station, but it was constructed on the highest position available.
Jaoli S. ... Lat. 33° 16′ 49″. Long. 73° 12′ 55″. Rawul Pindee District.	...	1,918·4	*Upper Markstone.*—This station is situated on a mound of boulders about 1½ miles to the north of the large and well known village of Sookho. The small village of Jaoli, after which the station is named, is about a quarter of a mile to the south. The station is marked by the usual pillar and platform.

North-west Himalayas, between Dehra Doon and Peshawur.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Nerh H. S. ... Lat. 33° 43′ 58″. Long. 73° 35′ 14″. Rawul Pindee District.	...	6,076·0	*Upper Markstone.*—This station is situated on the well known hill of the same name. A station was formerly erected on the same hill by Lieutenant Robinson for the Hazara Survey, but the two are not identical. The site of Lieutenant Robinson's station having been leveled and a Bungalow built on it.
Mongri H. S. ... Lat. 32° 48′ 7″. Long. 72° 49′ 48″. Jhelum District.	...	2,473·7	*Upper Markstone.*—Is situated on a low hill immediately north of the salt range. The nearest village, Shamsabad, is about two miles to the north-east of the station. The village of Khie is at about the same distance to the north-west. The station could not be placed upon the highest point in consequence of the Chail Mountain obstructing the view to Jogi Tila, and it therefore commands no view to the south and south-west.
Khagriana H. S. ...	...	3,939·4	Vide page 92.
Soorla H. S. ...	...	2,141·8	" 90.
Loiset H. S. ...	...	2,388·8	" 92.
Gandgurh H. S. ...	...	4,401·0	" 92.
Pathrijala H. S. ...	..	2,161·3	" 90.
Agzar S. or E. end Base ...	...	1,052·7	" 91.
Kaloo S. or W. end Base ...	1,018·15	...	" 91.
Paujpir H. S. ... Lat. 34° 5′ 45″. Long. 72° 31′ 17″. Eusofzai District.	...	2,053·9	This station is situated immediately above the village of the same name.
Attock H. S. ... Lat. 33° 53′ 2″. Long. 72° 18′ 35″. Rawul Pindee District.	...	2,078·9	*Upper Markstone.*—This point is on the peak immediately above the Attock Fort. There is also another mark upon the same range on a higher part of the hill, about 0·7 mile in a south-east direction.

North-west Himalayas, between Dehra Doon and Peshawur.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Karamar H. S. ... Lat. 34° 15′ 21″. Long. 72° 19′ 17″. Eusofzai District.	...	3,394·1	*Upper Markstone.*—Is placed on the peak close to and west of the Ziarat of the Pir by name Eka Eusof. The hill is about three miles north-east of the large village of Smailha or Ismailha, and a little less due north from the smaller village of Dina or Adina. This station is not identical with that used by Lieut. J. T. Walker.
Pir Sabak H. S. ... Lat. 34° 1′ 32″. Long. 72° 5′ 55″. Khuttuck District.	...	1,276·2	*Upper Markstone.*—Is on the summit of the hill east of the village of Pir Sabak, on the left bank of the Cabool or Loonda river. The hill is also called Pir-ka-tekri.
Tukht-i-Bahi H. S. ... Lat. 34° 17′ 3″. Long. 71° 58′ 46″. Eusofzai District.	...	1,771·3	*Upper Markstone.*—This station is on the westernmost peak of the hill of that name, about five miles west of the well known village of Goojargarhi.
Peshawur Gorkatri. ... Lat. 34° 0′ 33″. Long. 71° 37′ 18″. Peshawur District.	...	1,165·1	*Upper Markstone.*—Is on the middle of the roof of the building in the town called the Gorkatri, near the gate called the Lahori Durwaza.

SECTION XV.

Western Longitudinal Triangulation.

This is the western Section of an Arc of Longitude which connects Calcutta and Karachi. It lies between the Base Lines at Karachi and at Sironj in Central India; passes over Neemuch, Oodepoor, and Mount Aboo; crosses the Arabulli Range and the great desert of Rajpootana to the north of the Runn of Cutch; and crosses the Indus between Jerruk and Tattah. The heights of the stations at its extremities have been fixed by the leveling operations, and the error intermediately generated by the vertical triangulation, has been dispersed by proportion.

Longitudinal Triangulation, from Karachi to Sironj.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Bolalio H. S. ..	..	1,091·1	Vide page 45.
Bole H. S. ..	...	491·5	" 39.
N. End Base T. S. ...	204·40	...	" 38.
S. End Base T. S. ...	46·38	...	" 38.
Muggur Pir H. S. ...	...	585·2	" 39.
Myo H. S. ...	...	780·2	" 45.
Sawajee H. S. Lat. 25° 13′ 31″. Long. 67° 33′ 6″. Sind District. ...	...	1,135·1	*Upper Markstone.*—Is situated on the highest point of a high rocky hill having nothing to distinguish it from its neighbours. The surrounding country is wild, arid, and stony in the extreme. There are no villages seen from the station.
Kara H. S. Lat. 25° 1′ 44″. Long. 67° 41′ 47″. Sind District. ..	...	1,455·7	*Upper Markstone.*—Is on a high hill precipitous to the east, but sloping gently to the west. The station is on the southern of two points. Water is found in the bed of a river at the foot of the hill on the west, but there is no village, nor any means of procuring supplies.
Sahijee H. S. Lat. 24° 51′ 1″. Long. 67° 38′ 27″. Sind District. ...	...	445·0	*Upper Markstone.*—So called from the range on which it is situated. Is on a small mound on the northern edge of a long flat range, forming the southern side of the river or dry nullah, from which it is distant about 300 yards; there is a tomb adjoining it. The well known small temple of Rumpitianee is about one and a half miles north of the station.
Koonee H. S. Lat. 25° 10′ 40″. Long. 67° 48′ 11″. Sind District. ...	...	824·2	*Upper Markstone.*—The hill so called is one of the highest on the western plateau which it here helps to terminate. Its eastern face is very steep, even, precipitous, whilst the western side slopes gradually down to the neighbouring dry river. The station is on the highest point of the hill, and on the very edge of the precipice. There are no villages near the station.

Longitudinal Triangulation, from Karachi to Sironj.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Karothol H. S. ... Lat. 24° 53′ 47″. Long. 67° 56′ 0″. Kurrachee Collectorate, Sind	...	259·8	*Upper Markstone.*—The station is situated on the highest part of the hillock so called, which runs north and south. Water is found in a large pool to the south, on the banks of which herdsmen have generally a few huts.
Ghatana H. S. ... Lat. 25° 3′ 57″. Long. 68° 1′ 2″. Sind District.	...	229·7	*Upper Markstone.*—Is situated on the highest point of a long, low, isolated range (about a mile and a half in length), running north and south, and rising out of a high and extensive table-land. The station derives its name from the village of Ghatana, distant about 0 8 mile.
Helaya H. S. ... Lat. 24° 52′ 24″. Long. 68° 5′ 18″. Sind District.	...	121·3	*Upper Markstone.*—Is about one mile from the west bank of the Indus and within 200 yards of the main road running from Jerruck to Tattah. The station derives its name from the village so called, which is distant about four miles.
Dadoori H. S. ... Lat. 24° 59′ 44″. Long. 68° 13′ 3″. Sind District.	...	173·6	*Upper Markstone.*—This point is called after a hunting preserve about a quarter of a mile to the south. It is situated about 300 yards from the west bank of the Indus and about two miles south-west of the large village of Soonda.
Kanad T. S. ... Lat. 24° 55′ 56″. Long. 68° 24′ 55″. Hydrabad District, Sind.	...	88·1	*Upper Markstone.*—This tower is situated to the west of, and close to the village of the same name.
Chootlee T. S. ... Lat. 24° 46′ 20″. Long. 68° 26′ 8″. Hydrabad District, Sind.	...	72·3	*Upper Markstone.*—Is situated in the village of the same name, which lies about a mile and a half north-west of the village of Khorwa.
Katbaman T. S. ... Lat. 24° 52′ 52″. Long. 68° 36′ 56″. Hydrabad District, Sind.	...	82·7	*Upper Markstone.*—Is situated on a high mound of earth formed by the ruins of the ancient city of Katbaman. There are two villages of the same name near the station. An old musjid stands about 40 feet south of the tower.

Longitudinal Triangulation, from Karachi to Sironj.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Kakeyja T S. ... Lat. 24° 42′ 56″. Long. 68° 36′ 47″. Hydrabad District, Sind.	...	73·3	*Upper Markstone* —This station is situated on a mound about 0·3 mile to the south-west of the village of Kakeyja, from which it derives its name.
Naga Shah T. S. ... Lat. 25° 1′ 2″. Long. 68° 36′ 34″. Hydrabad District, Sind.	...	88·4	*Upper Markstone.*—Is situated about 0·4 mile from the village of Naga Shah, after which it has been named.
Alum Khan T. S. ... Lat. 24° 49′ 31″. Long. 68° 46′ 15″. Hydrabad District.	...	67·1	*Upper Markstone.*—This tower is distant about 0·15 mile from the village of Alum Khan Ligaree, after which it has been called.
Hakimanee T. S. ... Lat. 24° 58′ 52″. Long. 68° 45′ 15″. Hydrabad District, Sind.	...	78·0	*Upper Markstone.*—Is situated about 0·6 mile from the village of Bilasund, and about 1·5 from that of Alipore.
Dung-ka-Bustee T. S. ... Lat. 24° 54′ 50″. Long. 68° 56′ 0″. Hydrabad District, Sind.	...	72·4	*Upper Markstone.*—Is situated in the centre of the village, from which it derives its name.
Shah Toorail T. S. ... Lat. 24° 46′ 20″. Long. 68° 56′ 19″. Hydrabad District, Sind.	...	58·7	*Upper Markstone.*—This tower is situated in the centre of the village so called, from which it derives its name.
Nidimanee T. S. ... Lat. 25° 4′ 24″. Long. 68° 54′ 28″. Hydrabad District, Sind.	...	92·9	*Upper Markstone.*—Is on the ruins of an ancient town, and is distant about 0·4 mile from the village of Nidimanee, from which it derives its name, and about two miles from the town of Golam Ali Tanda.
Adoori T. S. ... Lat. 24° 50′ 21″. Long. 69° 5′ 52″. Hydrabad District, Sind.	...	55·8	*Upper Markstone.*—Is called after the village of the same name, from which it is distant about 1·5 miles.
Khori T. S. ... Lat. 25° 0′ 31″. Long. 69° 5′ 33″. Hydrabad District, Sind.	...	62·7	*Upper Markstone.*—Is distant about one mile from the largest of the three villages of Kheri, after which the station has been named.

Longitudinal Triangulation, from Karachi to Sironj.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Farraha T. S. ... Lat. 24° 55′ 42″. Long. 69° 13′ 56″. Hydrabad District, Sind.	...	58·4	*Upper Markstone.*—Has been called after the village of Farraha, from which it lies about 0·3 mile distant.
Pungra T. S. ... Lat. 24° 46′ 11″. Long. 69° 14′ 4″. Hydrabad District, Sind.	...	49·0	*Upper Markstone.*—Lies about 0·4 mile from the village of the same name, after which it has been called.
Jan Mohamad T. S. ... Lat. 25° 4′ 16″. Long. 69° 15′ 17″. Hydrabad District, Sind.	...	54·2	*Upper Markstone.*—This tower is in the centre of the village so called, from whence it derives its name.
Ameer Shah T. S. ... Lat. 25° 0′ 10″. Long. 69° 23′ 6″. Hydrabad District, Sind.	...	47·0	*Upper Markstone.*—Derives its name from the village so called, which is distant from the station about 70 yards.
Marab-ka-shahr T. S. ... Lat. 24° 50′ 11″. Long. 69° 22′ 53″. Hydrabad District, Sind.	...	44·4	*Upper Markstone.*—Lies about two miles from the village so called, whence its name.
Boogia H. S. ... Lat. 24° 56′ 11″. Long. 69° 36′ 36″. Bhooj District.	...	277·8	*Upper Markstone.*—Is situated on a sand hill in the Thurr or Little Desert appertaining to Bhooj, and is distant about a mile and a half from the village of Haida.
Manjakar T. S. ... Lat. 25° 6′ 58″. Long. 69° 30′ 24″. Hydrabad District, Sind.	...	45·6	*Upper Markstone.*—Lies about two miles from the village of Manjakar, from which it derives its name.
Padria H. S. ... Lat. 24° 44′ 9″. Long. 69° 32′ 51″. Bhooj District.	...	301·8	*Upper Markstone.*—Is on a sand hill so called in the Thurr or Little Desert of Bhooj, and is distant about two miles and a half from the village of Saydia.
Sodachur H. S. ... Lat. 25° 6′ 25″. Long. 69° 45′ 21″. Bhooj District.	...	333·1	*Upper Markstone.*—This station is on a sand hill in the Thurr or Little Desert of Bhooj. There are no villages visible from the station.

Longitudinal Triangulation, from Karachi to Sironj.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Kul H. S. ... Lat. 24° 46′ 53″. Long. 69° 50′ 3″. Bhooj District.	...	478·8	*Upper Markstone.*—This point is on a sand hill in the Little Desert of Bhooj, and lies about two miles and three-quarters from the town of Mittee.
Changa H. S ... Lat. 24° 53′ 47″. Long. 69° 53′ 51″. Bhooj District.	...	348·9	*Upper Markstone.*—Is situated on a sand hill so called in the Thurr or Little Desert of Bhooj. The station lies about three and a half miles from the town of Cheylar.
Foolrar H. S. ... Lat. 24° 52′ 56″. Long. 70° 6′ 8″. Bhooj District.	...	474·3	*Upper Markstone.*—Is on a sand hill in the Thurr or Little Desert appertaining to Bhooj, and lies about one mile from the village of Foolrar, whence its name.
Drabbie H. S. ... Lat. 24° 43′ 44″. Long. 70° 6′ 19″. Bhooj District.	...	381·6	*Upper Markstone.*—Is fixed on a sand hill in the Little Desert of Bhooj. The village of Dapiar lies south-west by south, distant two miles, and the town of Islamkote, south, about four miles.
Sandohur H. S. ... Lat. 25° 3′ 4″. Long. 70° 1′ 22″. Bhooj District.	...	408·5	*Upper Markstone.*—Is situated on a sand hill in the Thurr or Little Desert of Bhooj, and lies about three-quarters of a mile distant from the village of Sandohur, whence its name.
Erniala H. S. ... Lat. 24° 48′ 17″. Long. 70° 13′ 6″. Bhooj District.	...	484·8	*Upper Markstone.*—Derives its name from the village so called, which lies about a mile from the sand hill on which the station has been fixed.
Rojhra H. S. ... Lat. 24° 57′ 26″. Long. 70° 16′ 45″. Bhooj District.	...	518·3	*Upper Markstone.*—This station is on a sand hill in the Thurr or Little Desert of Bhooj. The village of Purreara lies about three and a half miles to the north-north-west of the station.
Pucka Kotee H. S. ... Lat. 24° 50′ 5″. Long. 70° 26′ 38″. Bhooj District.	...	519·5	*Upper Markstone.*—Is on a sand hill in the Little Desert of Bhooj. The station lies about four miles north-west by west of the village of Bakria.

Longitudinal Triangulation, from Karachi to Sironj.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Dharindera H. S. ... Lat. 25° 0′ 2″. Long. 70° 26′ 44″. Bhooj District.	...	539·4	*Upper Markstone.*—Is on a sand hill in the Little Desert of Bhooj, and lies about three-quarters of a mile from the village of Dharindera, from which the station has been named.
Toogoosar H. S. ... Lat. 24° 49′ 55″. Long. 70° 39′ 20″. Bhooj District.	...	512·4	*Upper Markstone.*—This point is on a sand hill in the Little Desert of Bhooj, and lies about 1·2 miles from the village of the same name.
Loonki H S. ... Lat. 24° 58′ 23″. Long. 70° 42′ 10″. Bhooj District.	...	588·1	*Upper Markstone.*—Is situated on a sand hill in the Thurr or Little Desert of Bhooj, and is distant about two miles from the village of Dadia and about 1·7 miles from that of Junjee kaku.
Alumshahr H. S. ... Lat. 24° 52′ 2″. Long. 70° 53′ 2″. Bhooj District.	...	492·2	*Upper Markstone.*—Is named after the sand hill situated in the Thurr or Little Desert of Bhooj, and is 2·8 miles distant, south by south-east, from the village of Lonia.
Karibhit H. S. ... Lat. 25° 0′ 28″. Long. 70° 50′ 48″. Bhooj District.	...	595·1	*Upper Markstone.*—Is called after the sand hill on which the station has been fixed, situated in the Thurr or Little Desert of Bhooj, distant about 2·5 miles west of the village of Basarnia.
Jhoond H. S. ... Lat. 24° 47′ 51″. Long. 71° 1′ 20″. Bhooj District.	...	373·8	*Upper Markstone.*—Is situated on a sand hill in the Thurr or Little Desert of Bhooj. It is about two miles distant from the village of Jhoond, whence its name.
Veraria H. S. ... Lat. 24° 56′ 36″. Long. 71° 5′ 26″. Bhooj District.	...	459·6	*Upper Markstone.*—This station derives its name from the sand hill on which it stands, situated in the Thurr or Little Desert of Bhooj, and is about three miles from the large village of Jherpa.
Sohagi H. S. ... Lat. 24° 48′ 3″. Long. 71° 10′ 4″. Bhooj District.	...	268·9	*Upper Markstone.*—This station is on a sand hill in the Thurr or Little Desert of Jodhpoor, and is about three and a half miles distant from the large and noted town of Bakasir. It has been named after the village of Sohagi, distant three-quarters of a mile.

Longitudinal Triangulation, from Karachi to Sironj.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Bhilgaon H. S. ... Lat. 24° 41′ 34″. Long. 71° 7′ 11″. Bhooj Territory.	...	100·4	*Upper Markstone.*—Is on a sand hill in the Thurr or Little Desert of Bhooj. The village of Samwaree, north-west of the station, is distant about two miles.
Gangasara H. S. ... Lat. 24° 58′ 40″. Long. 71° 14′ 2″. Bhooj Territory.	...	428·1	*Upper Markstone.*—This station is fixed on a sand hill in the Thurr or Little Desert of Bhooj, and derives its name from the village so called, situated to the north-east, and distant from two to three miles. The village of Faglia lies south about two miles and a half.
Akoria S. ... Lat. 24° 40′ 43″. Long. 71° 18′ 59″. Jodhpoor Territory.	...	55·9	*Upper Markstone.*—Is situated on a little mound on the north border of the Runn of Cutch, which commences a few feet from it. The Desert also adjoins the station, which has been named after a village that formerly existed near the site. The large village of Khegriali is six miles distant.
Dedawa H. S. ... Lat. 24° 51′ 19″. Long. 71° 21′ 25″. Jodhpoor Territory.	...	211·7	*Upper Markstone.*—This station is in the Thurr or Little Desert, and has been named after the hamlet so called, situated three-quarters of a mile from it.
Dhingpoora S. ... Lat. 24° 43′ 46″. Long. 71° 28′ 18″. Jodhpoor Territory.	...	92·2	*Upper Markstone.*—Has been named after the swell of sand on which it stands, as also after the village so called, situated two miles to the west.
Honitali S. .. Lat. 24° 35′ 5″. Long. 71° 26′ 2″. Palhanpoor Territory.	...	134·3	*Upper Markstone.*—Is situated on a low swell of sand of the same name, about two miles north of the village of Bunno tree, and about ten miles from the eastern border of the Desert.
Tampee H. S. ... Lat. 24° 52′ 39″. Long. 71° 29′ 37″. Jodhpoor Territory.	...	180·0	*Upper Markstone.*—Is situated on a low sand hill on the eastern border of the Desert, and has been named after the village so called, distant two miles to the east of the station.

Longitudinal Triangulation, from Karachi to Sironj.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Rajoora T. S. ... Lat. 24° 35′ 15″. Long. 71° 34′ 47″. Palhanpoor Territory.	...	162·4	*Upper Markstone.*—Is situated on the site of the deserted village of Rajoora, which name the spot still retains. The station is six miles north of the village of Sarao.
Serla S. ... Lat. 24° 46′ 45″. Long. 71° 36′ 35″. Jodhpoor Territory.	...	132·1	*Upper Markstone.*—Is situated on a slightly elevated swell bearing the name of Serla. It is about two miles south-east of the large village of Jamnee.
Golasan T. S. ... Lat. 24° 41′ 8″. Long. 71° 46′ 26″. Jodhpoor Territory.	...	221·2	*Upper Markstone.*—Is situated about a mile east of the village of Golasan, and about five miles south-west of the town of Sachore.
Waladhar S. ... Lat. 24° 32′ 7″. Long. 71° 48′ 20″. Palhanpoor Territory.	...	290·3	*Upper Markstone.*—Is situated on a rising Knoll about two miles west by south of the village so called. Kahilgaon village lies four miles to the north, and Lohanna about the same distance to the north-east.
Dawal S. ... Lat. 24° 50′ 33″. Long. 71° 45′ 20″. Jodhpoor Territory.	...	160·9	*Upper Markstone.*—Is the name of the low swell of sand on which the station stands as well as of the village of the same name, situated about half a mile to the east of it.
Kankaria S. ... Lat. 24° 36′ 56″. Long. 71° 55′ 36″. Guicowar's Territory.	...	361·6	*Upper Markstone.*—Is the name of the low swell of sand on which the station stands. The large village of Ninawa is about three miles and a half north-east of the station. There is also a smaller one called Baja about two miles off.
Kosia S. ... Lat. 24° 46′ 43″. Long. 71° 55′ 59″. Jódhpoor Territory.	...	322·9	*Upper Markstone.*—Derives its name from the swell of sand on which it is situated. Pyer or Pier village is about two miles north of the station, the town of Sachore being about nine miles distant.
Atethol S. ... Lat. 24° 42′ 25″. Long. 72° 6′ 29″. Palhanpoor Territory.	...	652·4	*Upper Markstone.*—Is situated on a high bank or ridge of sand about a mile and a half north-east of the large village of Yeta.

Longitudinal Triangulation, from Karachi to Sironj.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Setora S. ... Lat. 24° 30′ 35″. Long. 72° 8′ 33″. Palhanpoor Territory.	...	624·9	*Upper Markstone.*—Is named after the high bank of sand on which the station is situated. The town of Dhanala lies about five miles to the west of the station, which has also the following villages adjacent to it; Rampoora south-west about one and a half miles; Voroo about three-quarters of a mile west by north; Wadir about one mile south.
Thullee S. ... Lat. 24° 52′ 50″. Long. 72° 4′ 27″. Jodhpoor Territory.	...	455·8	*Upper Markstone.*—Derives its name from the swell of sand on which it is fixed. The village of Gondao, six miles off to the south, and that of Kurra, eight miles off to the east, are the nearest villages to the station.
Bargaon H. S. ... Lat. 24° 40′ 29″. Long. 72° 17′ 23″. Jodhpoor Territory.	...	1,809·1	*Upper Markstone.*—Is situated on the highest point of a conspicuous isolated hill about two miles south-west of the town of Bargaon, from whence it derives its name. The summit of the hill consists entirely of the hardest granite disposed in vast masses, bold and abrupt in form.
Samaro H. S. ... Lat. 24° 49′ 8″. Long. 72° 16′ 30″. Jodhpoor Territory.	...	1,458·6	*Upper Markstone.*—Is situated on the highest point of the easternmost of two irregular ranges of low hills which seem to terminate the hill country, all to the westward being an unvaried plain. About three miles to the west of the station lies the small village of Maree, and about four miles to the west, the large village of Mallwara.
Verona H. S. ... Lat. 24° 26′ 39″. Long. 72° 15′ 32″. Palhanpoor Territory.	...	672·9	*Upper Markstone.*—Is situated on the summit of a gentle swell of ground about one mile from the village of Verona.

Longitudinal Triangulation, from Karachi to Sironj.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Soonda H. S. ... Lat. 24° 46′ 51″. Long. 72° 27′ 45″. Jodhpoor Territory.	...	3,251·7	*Upper Markstone.*—Is situated upon an isolated group of high hills about 24 miles west by north of Mount Aboo. The southern half of this group is known as the Neemuj hills, from the town of Neemuj, which lies at their foot. The ascent commences at the small village of Oosmat, on the eastern side of the hill.
Jeyraj H. S. ... Lat. 24° 25′ 0″. Long. 72° 32′ 30″. On the boundary between Jodhpoor and Palhanpoor.	...	3,575·2	*Upper Markstone.*—Is situated on the summit of a high and extensive hill lying between Mount Aboo and Deesa. The hill is named Jeyraj after a deity said to reside at its foot.
Bonik H. S. ... Lat. 25° 3′ 52″. Long. 72° 54′ 22″. Jodhpoor Territory.	...	2,098·3	*Upper Markstone.*—Is situated in a group of hills which are unconnected with the Arabulla range, and lies 25 miles north of Mount Aboo. The station is fixed on the most prominent though not the most elevated hill of the group, being an acute peak crowned with large naked masses of granite of square outline.
Gooroo Sikkar H. S. ... Lat. 24° 38′ 58″. Long. 72° 49′ 7″. Serohi Territory.	...	5,650·1	*Upper Markstone.*—This station is situated on the highest pinnacle of Mount Aboo. The small rock temple of Gooroo Sikkar, the resort of pilgrims from all parts of India, adjoins the station towards the south-west. The sacred character of the whole hill and of the Gooroo Sikkar in particular is too well known to require any further notice here.
Mard H. S. ... Lat. 24° 24′ 9″. Long. 72° 59′ 48″. Eedur Territory.	...	3,080·3	*Upper Markstone.*—Is situated on a high group of hills forming the southern portion of the Arabulla range.
Bailka H. S. ... Lat. 24° 46′ 55″. Long. 73° 11′ 44″. Serohi Territory.	...	3,599·4	*Upper Markstone.*—Is situated on a high hill of that name in the midst of the Arabulla range, and is distant 24 miles from Mount Aboo.

Longitudinal Triangulation, from Karachi to Sironj.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Zalio H. S. ... Lat. 24° 34′ 20″. Long. 73° 21′ 43″. Oodeypoor Territory.	...	3,826·6	*Upper Markstone.*—Is situated on the summit of one of the highest peaks of the Arabulla range, and derives its name from the hill which is so called. The small town of Ohgna lies about two miles south of the station, and that of Joorah about six miles south-west.
Kannagar H. S. ... Lat. 24° 58′ 29″. Long. 73° 21′ 27″. Jodhpoor Territory.	...	3,606·9	*Upper Markstone.*—Derives its name from the hill on which it is situated. This peak forms part of the Arabulla Mountains, and lies upon the western flank of the range. It is about 19 miles north-west of the Cantonment of Erinpoora, and is in the Jodhpoor Territory. The approach to the station is from the village of Bijapoor, about seven miles north by west of the station. The ascent is about five miles long.
Mall Nevair H. S. ... Lat. 24° 59′ 22″. Long. 73° 38′ 57″. Oodeypoor Territory.	...	3,875·8	*Upper Markstone.*—This station like Tair H. S. is situated on one of the clusters of hills rising from the plateau of the Arabullas. It is not the highest point in the cluster, though nearly so. The following villages are in the vicinity of the station, viz., Samucha, a large village about four miles to the north; Numdar, about three miles north by east; Atroomba, about two miles north, it is from this village that the ascent is made; Mall, a small village in the midst of the cluster south by east. The hill is named Nevair, to which as a distinction the name of the last mentioned village is prefixed.
Tair H. S. ... Lat. 24° 47′ 11″. Long. 73° 39′ 20″. Oodeypoor Territory.	...	3577 3	*Upper Markstone.*—This station is situated on one of the highest points of the ridges in the table-land of the Arabullas. On the north-west side is the large village of Bootala, and it is by its vicinity to this village that it is best known. The ascent is by the eastern side.

Longitudinal Triangulation, from Karachi to Sironj.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Marwar H. S. ... Lat. 24° 26′ 20″. Long. 73° 35′ 13″. Oodeypoor Territory.	...	3,433·1	*Upper Markstone.*—Is situated upon a high ridge of the Arabulla range, in the midst of a wild tract, and derives its name from the hill which is so called. The village of Jharol lies about three miles west of the station, at the foot of the hill.
Tiki H. S. ... Lat. 24° 55′ 38″. Long. 73° 53′ 12″. Oodeypoor Territory.	...	2,369·0	*Upper Markstone.*—Is fixed upon the highest of an irregular cluster of low hills east of the large town of Nathdwara (commonly called Nadwara) celebrated for its sanctity. Tiki is the name of the particular point upon which the station is situated.
Lakarwas H. S. ... Lat. 24° 31′ 48″. Long. 73° 52′ 10″. Oodeypoor Territory.	...	2,574·4	*Upper Markstone.*—Is situated on the range of high hills forming the eastern defence of the city of Oodeypoor, and derives its name from the large village so called, situated at the foot of the hill on the west side. The ruined gate called Sijah-ka-Darwaza, which forms one of the approaches to Oodeypoor, is on the same ridge, two miles north of the station, from which the city itself is visible.
Bharak H. S. ... Lat. 25° 8′ 22″. Long. 74° 18′ 40″. Oodeypoor Territory.	...	2,262·1	*Upper Markstone.*—Is on the highest group of pointed hills rising from the plain that lies to the east of the Arabulla range. The station is fixed close to a temple on the summit of a hill adjoining it on the south side. The temple is dedicated to the Goddess Bharka, whence the name of the hill. At the foot of the hill on its eastern side lies the small village of Bharak, and about four miles to the south-west is the large town of Poatla.
Tana H. S. ... Lat. 24° 43′ 4″. Long. 74° 13′ 44″. Oodeypoor Territory.	...	2,089·3	*Upper Markstone.*—Is situated on the highest point of the well known isolated hill named Tana. At the foot of the hill to the south lies the large village of the same name.

Longitudinal Triangulation, from Karachi to Sironj.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Borikalore H. S. ... Lat. 24° 20′ 52″. Long. 74° 15′ 2″. Oodeypoor Territory.	...	1,599·0	*Upper Markstone.*—Is situated in a wild thinly populated tract of hilly country, forming the eastern outskirts of the Arabulla range. This hill, though a low one, is the highest in the immediate vicinity. It is not a prominent point, nor is it one easily found, being in a locality little frequented. The following towns and villages are those nearest to the station: Kanaor, a large town about eight miles to the north; Valeecha, a large village about two miles east by south. The station is called after the hamlet of the same name situated at the foot on the south side. The well known Dehbur lake lies about 15 miles west by south.
Saund H. S. ... Lat. 24° 43′ 6″. Long. 74° 35′ 26″. Oodeypoor Territory.	...	1,909·7	*Upper Markstone.*—Is on a high irregular cluster of hills. The following villages are near the station, viz., Sawa, a large village to the north-north-east, about three miles; Saund, after which the station is named, lies about a mile and a half to the north by east; and Khareepoora, at the western foot of the hill, about one mile due west.
Barra Sadri H. S. ... Lat. 24° 23′ 21″. Long. 75° 31′ 42″. Oodeypoor Territory.	...	1,954·1	*Upper Markstone.*—Is on a high and extensive range of hills lying to the east of the Arabulla range, from which it is separated by a nearly level tract. The ascent to the station is long and tedious, and commences from the town of Barra Sadri, which is about two miles in a direct line from the station.
Mendki H. S. ... Lat. 24° 38′ 16″. Long. 74° 55′ 40″. Oodeypoor Territory.	...	1,951·1	*Upper Markstone.*—Is situated on the southern edge of the same extensive flat range as Nimthoor H.S., Rampoora H. S., and Nanka Hooaro H. S. The station of Jawud Neemuch lies in the plain below the station, towards the south-west, at a distance of three miles. The station is named after the village of Mendki.

Longitudinal Triangulation, from Karachi to Sironj.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Gopalpoora H. S. ... Lat. 24° 17′ 34″. Long. 74° 49′ 23″. Jawud Neemuch District.	...	1,854·5	*Upper Markstone.*—Is situated on a range of wild hills chiefly inhabited by Bheels. The station has been named after the large village of Gopalpoora, situated at the eastern foot of the hills, about a mile and a half distant. The village of Chota Khera is about three miles north-east of the station.
Nanka Hooaro H. S. ... Lat. 24° 31′ 48″. Long. 75° 17′ 0″. Sindhia's Territory.	...	1,860·3	*Upper Markstone.*—Is situated on the same range as Rampoora H. S. and Nimthoor H. S. The following villages are near the station, viz., Matasoaro, to the north about two miles; Nanka Hooaro, (sometimes called Nanka Sooaro,) about one and a half miles north-east by north; Mookree, about three miles west by north; Kherawudda, south about a mile and a half.
Arumlia H. S. ... Lat. 24° 25′ 7″. Long. 75° 1′ 33″. Jawud Neemuch District.	...	1,530·8	*Upper Markstone.*—The following villages are near the station: Deori, nerth two miles; Bijurwas, north-west by north one and a half miles; Kana Khera, north-west one and a half miles; Rattris, west two miles; Palsora or Parora, a large village south-east by south four miles; Arumlia, east one mile.
Balagarra H. S. ... Lat. 24° 10′ 22″. Long. 75° 0′ 16″. Sindhia's Territory.	...	1,804·1	*Upper Markstone.*—This station is on a high range of table-land about three miles from the village of Balagarra, which is situated at the foot of the hill.
Booda S. ... Lat. 24° 14′ 12″. Long. 75° 10′ 43″. Holkar's Territories.	...	1,525·2	*Upper Markstone.*—The following villages are near the station, viz., Booda village, one mile north-east; Gerrawud, due east two miles; Tullao Peepla, east by south one-fifth of a mile; Bajpoor, south-west 0·8 mile.
Rampoora H. S. ... Lat. 24° 28′ 44″. Long. 75° 29′ 19″. Holkar's Territories.	...	1,920·0	*Upper Markstone.*—Is situated on the high range of hills to the north of the large town of Rampoora.

Longitudinal Triangulation, from Karachi to Sironj.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Dhamna H. S. ... Lat. 24° 11′ 38″. Long. 75° 32′ 28″. Holkar's Territories.	...	1,591·2	*Upper Markstone.*—Is situated on an irregular group of hills, celebrated for the curious Dhamnar Caves or excavated Temples, and is within a few feet north of the principal Temple.
Nimthoor H. S. ... Lat. 24° 32′ 1″. Long. 75° 50′ 2″. Holkar's Territories.	...	1,658·8	*Upper Markstone.*—This point is about three miles north-east of the large town of Bhaupoor, and is situated upon the high range of hills that run continuously from that place to Rampoora. The station derives its name from the village so called, situated about a mile to the eastward at the foot of hills.
Kajoori H. S. ... Lat. 24° 14′ 14″. Long. 75° 45′ 56″. Holkar's Territories.	...	1,581·7	*Upper Markstone.*—Is situated on a small isolated flat topped hill. The following villages are near the station, viz., Nerkhera, north-west by west two miles; Sameli, north two and a half miles; Kotra, a large village east one mile; Kajoori, south-south-west one mile.
Gooraria H. S. ... Lat. 24° 25′ 32″. Long. 76° 7′ 29″. Holkar's Territories.	...	1,360·2	*Upper Markstone.*—Is fixed upon a small low isolated hill of irregular form. The village of Gooraria lies about one mile to the south. The large town of Soonail is about five miles off in the same direction. The city of Patun is visible from the station to the north-east.
Panchawa H. S. ... Lat. 24° 7′ 45″. Long. 75° 59′ 16″. Tonk Territory.	...	1,622·1	*Upper Markstone.*—This station is on the top of the most extensive of five adjacent isolated hills rising from the wide tableland forming the eastern side of the valley of the River Aboo. The station derives its name from the group in which it is fixed, whose number has conferred on it the designation of Panchawa or "Panch Pahar." The following villages lie around the base of the Panchawa group: Harowtea Kotree, north; Sarunga Khera, north-east by west; Parawa, a large village north-east; Dhabla, south; Ramaia west by south; and Nowli, north-west.

Longitudinal Triangulation, from Karachi to Sironj.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Banskati H. S. ... Lat. 24° 34′ 50″. Long. 76° 18′ 27″. Patun Territory.	...	1,463·0	*Upper Markstone.*—This station is situated upon the crest of a bold ridge of hills scarped on the western side, about eight miles from the city of Patun in an easterly direction. The small village of Banskati, from which the station is named, lies beneath to the eastward.
Koosalpoora H. S. ... Lat. 24° 17′ 33″. Long. 76° 22′ 9″. Ajmeer District.	...	1,440·7	*Upper Markstone.*—Is situated on about the highest part of the table-land on which the village of Koosalpoora is, from which it is distant about a mile and a quarter to the eastward.
Rangaon H. S. ... Lat. 23° 54′ 35″. Long. 76° 25′ 34″. Boundary between Holkar's and the Narsinghgarh Territories.	...	1,628·4	*Upper Markstone.*—This point is on the highest part of the hill so called, from the village of Rangaon, from which it lies in a north-west direction, and distant about a mile. Berkheri is south a mile and a half, Banskheri north-west a mile and a quarter, and Jharamow north-north-west a mile and a half.
Sartal H. S. ... Lat. 24° 30′ 4″. Long. 76° 39′ 44″. Patun Territory.	...	1,437·5	*Upper Markstone.*—The station is situated upon the high and extensive range of hills north of the town of Sartal, whose distance from the station is 1·55 miles.
Mata-ka-hora H. S. ... Lat. 24° 14′ 11″. Long. 76° 39′ 16″. Kilchpoora Territory.	...	1,645·4	*Upper Markstone.*—Is situated on a high hill in a wild and hilly tract, and has very small villages only in its immediate vicinity, viz., Dhand, at about a mile and a quarter east; Rosooldia, at one mile north-west; and Mawa Khera, at a mile and a half north. The hill is called Mata-ka-hora or hill of Mata, from a small temple dedicated to Mata, a Hindoo Deity which stands about 60 yards to the east of the station.
Dhawa H. S. ... Lat. 23° 49′ 18″. Long. 76° 39′ 25″. Narsinghgarh Territory.	...	1,601.1	*Upper Markstone.*—Is on the highest part of a high isolated hill of the same name, about a mile north-west of the village of Cowrapoor and two miles east-south-east of Bukher.

Longitudinal Triangulation, from Karachi to Sironj.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Nandna H. S. ... Lat. 24° 22′ 23″. Long. 77° 1′ 22″. Gwalior Territory.	...	1,681·9	*Upper Markstone.*—Is on one of the isolated hills of that name, near the Parbati river. The nearest village is Piperia, which lies near its foot at about a mile south-south-west of the station.
Dand H. S. ... Lat. 24° 4′ 3″. Long. 77° 8′ 33″. Rajgarh Territory.	...	1,736·5	*Upper Markstone.*—The station is situated on a high swell of one of the hills on the western side of the Parbati. It is about two miles north-east of the village of Napaneer, three miles south of Tehli, and one-third of a mile south of the small hamlet of Bheels named Dand.
Hatni H. S. ... Lat. 24° 30′ 29″. Long. 77° 16′ 17″. Ragogarh Territory.	...	1,821·9	*Upper Markstone.*—Is situated on a high peak of a range of hills, and lies about four miles north-north-east of Ragogarh, and a mile north-north-west of the small village of Poorena. The cantonment of Goonah lies about twelve miles to the north-north-west.
Saloth H. S. ... Lat. 24° 14′ 52″. Long. 77° 17′ 30″. Gurha Territory.	...	1,834·1	*Upper Markstone.*—The station is on a high peak of the hills immediately east of the valley of the Parbati. Saloth, from whence the station is named, is three miles west of it. Gaddia is about three-quarters of a mile east-south-east of the station.
Rampoor H. S. ... Lat. 24° 17′ 50″. Long. 77° 28′ 10″. Sindhia's Territory.	...	1,842·5	*Upper Markstone.*—This station is situated on the highest peak of a double-headed hill rising abruptly from the plain, and close to a small temple dedicated to the Hindoo Deity Bowanee. The village of Rampoor lies about a mile and a half west, and Araon four miles south of the station.
Tinsia H. S. ... Lat. 24° 6′ 28″. Long. 77° 20′ 58″. Tonk Territory.	...	1,776·4	*Upper Markstone.*—Is on a swell of the broken ground overlooking the valley of the Parbati, and is about half a mile south of the village of Tinsia, and five miles west-south-west of Isarwas.

Longitudinal Triangulation, from Karachi to Sironj.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Agar H. S. ... Lat. 23° 57′ 3″. Long. 77° 27′ 27″. Tonk Territory.	..	1,810·6	*Upper Markstone.*—Is situated on a high ridge of a mass of hills extending in a succession of ridges of about the same height for eight or nine miles to the west, but shelving down towards the east. It lies a mile east of the hamlet of Agar, and two miles south-south-west of Tenoli- or Tihloni to the land of which it appertains. The hills in its immediate vicinity have the general name of Agar-ka-puthar, but the particular spot on which the station is fixed is also called Kateri puthar.
Losalli T. S. ... Lat. 24° 6′ 19″. Long. 77° 35′ 41″. Tonk Territory.	...	1,748·6	*Upper Markstone.*—Is situated on a gentle undulation of the high table-land which rises immediately to the west of the Sironj Valley, one and a half miles west of the village of Pagrani and about a mile south-east of Barra Losalli, from whence it takes its name.
Surental H. S. ...	1,802·19	...	Vide page 134.
Kamkhera H. S. ...	...	1,780·1	Vide page 134.

SECTION XVI.

Jogi Tila Meridional Series.

This series originates at a side of the North-west Himalayan triangles, and follows the meridian—73½° east of Greenwich—of the well known Hill of Jogi Tila, near Jhelum, until it reaches the River Sutlej, in the vicinity of Pak Pattan, and Bahawulgarh. The relative heights of the Tower Stations Kothiala, Nar, Kadar, and all to the south, as far as and including the stations of Hoojan and Futti, were determined by Spirit Leveling Operations. Their absolute values are based on the determinations of Jogi Tila and Jaoli, as derived from the North-West Himalayan Series.

Jogi Tila Meridional Series, from Jhelum to Pak Pattan.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Jaoli H. S. ...	...	1,918·4	Vide page 155.
Jogi Tila H. S. ...	...	3,200·3	Vide page 155.
Roatala H. S. ... Lat. 33° 10′ 37″. Long 73° 37′ 44″. Jhelum District.	...	2,146·9	*Upper Markstone.*—Is situated on the summit of the high sandstone range between Bakrala and the River Jhelum. The road made up to it, for the theodolite, is on the west of the range. The ascent commences at Roatala, a small hamlet situated one koss north-east of the village of Lehri, and one koss south-east of Panchore. Mungul kote and Toogloo kote (or Ramgarh) both well known forts of Goolab Sing's, lie on the left bank of the Jhelum, at a distance of from three to four koss, the former to the east, the latter to the north-east. The peak on which the station is erected is called Lam-ki-parbat by the people of Roatala.
Koar H. S. ... Lat. 32° 47′ 23″. Long. 73° 44′ 11″. Goojerat District.	...	1,367·4	*Upper Markstone.*—This station was originally selected by Lieutenant Robinson for the survey of the Rawul Pindee and Jhelum Districts. It is situated on the low range east of the River Jhelum, a few miles south of the Kharian Pass, and is named after the nearest large village of Koar. The hill road between Koar and Dingee passes within a few yards of the station.
Chail H. S. ... Lat. 32° 47′ 27″. Long 73° 7′ 42″. Jhelum District.	...	3,687·5	*Upper Markstone.*—Is on a well known hill north of Pind Dadun Khan and east of the Choya Pass through the salt range. It is immediately above the village of Basharut, which is situated on one of the highest plateaux of the range. There are two roads through the hills to Basharut; one from Choya, the other from Jelalpoor, viâ Baghanwala and Aree. The latter is much the best of the two. The site of observation is on the summit of the hill, among sundry buildings tenanted by fakirs.

Jogi Tila Meridional Series, from Jhelum to Pak Pattan.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Nar T. S. Lat. 32° 27′ 21″. Long. 73° 18′ 45″. Shahpoor District. ...	...	737·5	*Surface of Pillar.*—This station is placed on a mound of the same name, 0·85 of a mile west of the hamlet of Mall; the nearest large village is Rookan, lying south at a distance of two miles.
Kothiala T. S. Lat. 32° 35′ 27″. Long. 73° 30′ 13″. Shahpoor District. ...	...	765·3	*Surface of Pillar.*—Is situated to the south of the village of Kothiala, 2·6 miles north of Sohawa Thana.
Ker T. S. Lat. 32° 31′ 13″. Long. 73° 39′ 11″. Goojerat District. ...	...	772·1	*Upper Markstone.*—This station is on the summit of Ker Shivala, a flat roofed Hindoo Tomb, near the village of Jaisook.
Kadar T. S. Lat. 32° 25′ 26″. Long. 73° 31′ 46″. Goojerat District. ...	...	752·4	*Surface of Pillar.*—Is on the high bank of the Nukka overhanging the Kadir lands of the Chenab, and is about 200 yards north-east of the village, after which it is named.
Jeto T. S. Lat. 32° 16′ 54″. Long. 73° 24′ 36″. Goojerat District. ...	...	714·2	*Surface of Pillar.*—The site of observation is in centre of the village from which the station derives its name.
Goonia T. S. Lat. 32° 19′ 15″. Long. 73° 13′ 41″. Shahpoor District. ...	...	723·9	*Surface of Pillar.*—Is situated on a high ridge near the village of the same name.
Hazara T. S. Lat. 32° 7′ 50″. Long. 73° 18′ 30″. Shahpoor District. ...	...	691·9	*Surface of Pillar.*—Is on the bank of the Channel of the river Chenab, two miles north of the old town of Tukht Hazara.
Bala T. S. Lat. 32° 8′ 52″. Long. 73° 30′ 12″. Goojeranwalla District. ...	...	706·5	*Surface of Pillar.*—The station is on the north-west corner of the village Nowa Bala, (or Bala Khoord,) about 200 yards west of the new Military Road from Mooltan to Wuzeerabad.
Sadoolapoor T. S. Lat. 32° 14′ 53″. Long. 73° 38′ 12″. Goojeranwalla District.	...	732·8	*Surface of Pillar.*—Will be found in the centre of the village of the same name.

Jogi Tila Meridional Series, from Jhelum to Pak Pattan.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Mogo T. S. ... Lat. 32° 0′ 40″ Long. 73° 27′ 1″. Goojeranwalla District.	...	695·4	*Upper Markstone.*—Is built on an isolated ruined tower, a few yards west of the village of Mogo.
Shah Jamal T. S. ... Lat. 32° 1′ 38″. Long. 73° 36′ 16″. Goojeranwalla District.	...	710·1	*Surface of Pillar.*—Is a few yards west of Shah Jamal village.
Futti T. S. ... Lat. 31° 52′ 11″. Long. 73° 31′ 37″. Goojeranwalla District.	...	701·7	*Surface of Pillar.*—Is situated on a mound so called by the side of the great road from Pindi Bhatean to Lahore.
Hoojun T. S. ... Lat. 31° 52′ 22″. Long. 73° 20′ 30″. Goojeranwalla District.	...	671·0	*Surface of Pillar.*—This station is placed on the ridge near Hoojun village, two miles south-east of the town of Pindi Bhatean.
Lodri T. S. ... Lat. 32° 0′ 2″. Long. 73° 17′ 30″. Goojeranwalla District.	...	657·8	*Surface of Pillar.*—Is in the low lands, on the left bank of the river Chenab.
Sangla H. S. ... Lat. 31° 42′ 38″. Long. 73° 25′ 34″. Goojeranwalla District.	...	839·3	*Upper Markstone.*—The site of observation is on the summit of a well known hill in the centre of the Bar of the Rechnee Doab.
Asroor T. S. ... Lat. 31° 47′ 3″. Long. 73° 41′ 26″. Goojeranwalla District.	...	740·4	*Upper Markstone.*—Is built on a high mound in the village Asroor, near the shrine of Mian Ali.
Shah Kote H. S. ... Lat. 31° 34′ 13″. Long. 73° 30′ 14″. Jhung District.	...	771·3	*Upper Markstone.*—Is situated on the southern ridge of hills west of the village of Shah Kote.
Chiniout H. S. ... Lat. 31° 43′ 32″. Long. 73° 0′ 59″. Jhung District.	...	834·6	*Upper Markstone.*—This station is on the summit of a hill over the town after which station is named.

SECTION XVII.

Gurhagarh Meridional Series.

This Series of Principal Triangles is nearly 75° east of Greenwich, following the meridian of the station of the North-west Himalaya Series, whence its name is derived. It originates near the town of Jammoo, the winter residence of the Maharajah of Kashmir, and passes east of Sealkote, Umritsur, Ferozpoor, and Sirsa. It crosses the desert tracts of Eastern Rajpootana, passes the city of Ajmeer, and terminates near the cantonment of Neemuch, on the Longitudinal Series of triangles which connects Calcutta and Karachi.

Gurhagarh Meridional Series, from Jammoo to Neemuch.

Names of Stations.		Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Gurhagarh H. S.	...	...	2,032·8	Vide pages 153 and 154.
Dehra S.	...	...	894·6	
Ranjitgarh T. S. Lat. 32° 35′ 12″. Long. 74° 39′ 41″. Sealkote District.	...	...	900·2	*Surface of Pillar.*—Is built in the middle of the old Fort of Ranjitgarh, close to the road from Sealkote to Chaprar and Jammoo, about seven miles from the station of Sealkote.
Roorki T. S. Lat. 32° 25′ 29″. Long. 74° 46′ 25″. Sealkote District.	...	..	903·8	*Surface of Pillar.*—Is situated on a high mound immediately north-west of the village of the same name. The tower has been built on the site of the north-west angle of an old Fort on the top of the mound.
Deoli T. S. Lat. 32° 24′ 45″. Long. 74° 58′ 47″. Sealkote District.	...	..	976·2	*Surface of Pillar.*—This station is on the remains of a Fort at the north-west corner of Deoli village.
Bhuru-chak, T. S. Lat. 32° 26′ 55″. Long. 75° 9′ 13″. Goordaspoor District.	...	...	1,078·5	*Surface of Pillar.*—Is about 250 yards to the south-west of the village of Bhuru-chak, in the high lands stretching from the foot of the outermost sandstone range.
Atalgarh T. S. Lat. 32° 18′ 44″. Long. 75° 8′ 55″. Goordaspoor District.	...	...	958·1	*Surface of Pillar.*—This tower stands on the south-east bastion of the inner quadrangle of the ruined fort of Atalgarh, about 300 yards north-east of Sohowra village. The fort is on a very conspicuous mound, and commands an extensive view of the surrounding country.
Loongi T. S. Lat. 32° 16′ 6″. Long. 74° 58′ 42″. Sealkote District.	...	...	889·5	*Surface of Pillar.*—About 200 yards south-west of the little village of Loongi, and about one-third of a mile to the east of Langarkee, stands the tower denoting this site of observation.

Gurhagarh Meridional Series, from Jammoo to Neemuch.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Myloo-Syloo T. S. ... Lat. 32° 10′ 39″. Long. 75° 6′ 52″. Goordaspoor District.	...	870·8	*Surface of Pillar.*—This station is situated on the south-east bastion of a ruined fort in the village of Myloo-Syloo, the village itself being on rather a conspicuous mound.
Khakka T. S. ... Lat. 32° 6′ 19″. Long. 74° 57′ 39″. Umritsur District.	...	824·4	*Surface of Pillar.*—The tower marking the site of observation will be found on a little mound about 600 yards south-east of the village of Khakka.
Shahpoor T. S. ... Lat. 32° 1′ 33″. Long. 75° 8′ 3″. Goordaspoor District.	..	830·2	*Surface of Pillar.*—Is on a mound to the right of the high road from Dehra Baba Nanak to Goordaspoor, and half way between the villages of Shahpoor, Goralla, and Kadeean. A narrow marsh lies between the mound and the Kadeean village.
Ramdas T. S. ... Lat. 31° 57′ 30″. Long. 74° 57′ 47″. Umritsur District.	...	796·5	*Surface of Pillar.*—Is situated about a mile to the south-east of the large town of Ramdas.
Siri T. S. ... Lat. 31° 52′ 36″. Long. 75° 7′ 11″. Goordaspoor District.	. .	845·9	*Surface of Pillar.*—About half a mile north by west of the village of Siri, and on a small mound near the left bank of a branch of the Baree Doab Canal, stands the tower marking this station.
Machi-Nangal T. S. ... Lat. 31° 48′ 17″. Long. 74° 56′ 39″. Umritsur District.	...	803·9	*Surface of Pillar.*—This tower is built about 300 yards north by west of the little village after which it is named.
Chowinda S. ... Lat. 31° 43′ 13″. Long. 75° 5′ 52″. Umritsur District.	...	833·0	*Upper Markstone.*—This station is at the south-west corner of Chowinda village, on a bastion of a ruined Fort. Chowinda is of some note as the shrine of Chowinda Devi, and attracts to its annual fair a great number of pilgrims from the surrounding country.

Gurhagarh Meridional Series, from Jammoo to Neemuch.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Toong T. S. Lat. 31° 39′ 17″. Long. 74° 56′ 58″. Umritsur District. ...	...	787·6	*Surface of Pillar.*—So named from the villages of Toong "Khoord" and Toong "Kulan" in its vicinity; is about three miles to the north-east of Umritsur, near the high road to Batala.
Dheeri-kot T. S. Lat. 31° 34′ 53″. Long. 75° 5′ 30″. Umritsur District. ...	...	808·8	*Surface of Pillar.*—Is situated on a small mound near the Punjab Grand Trunk Road. The station lies about one-third of a mile south-west of Gairi village, about half a mile north-west of Dheeri-kot, and little more than a mile to north-east of the Jandiala encamping ground.
Golwar T. S. Lat. 31° 31′ 13″. Long. 74° 56′ 38″. Umritsur District. ...	...	784·3	*Surface of Pillar.*—Is about 100 yards to the east of the village of Golwar, near the kutcha road leading from Umritsur to Hurree-kee-Puttun.
Kulla T. S. Lat. 31° 26′ 8″. Long. 75° 4′ 9″. Umritsur District. ...	...	784·2	*Surface of Pillar.*—This tower is a little better than half a mile to the west of the village after which it has been named.
Jandoki T. S. Lat. 31° 22′ 4″. Long. 74° 55′ 51″. Umritsur District. ...	...	767·8	*Surface of Pillar.*—Named after Jandoki village, from which it is about a mile south by west.
Sungutpoor T. S. Lat. 31° 17′ 34″. Long. 75° 4′ 47″. Umritsur District.	...	778·9	*Surface of Pillar.*—Will be found on a small mound about one-third of a mile south-west by south of Sungutpoor village.
Rabza T. S. Lat. 31° 13′ 50″. Long. 74° 56′ 46″. Lahore District.	...	769·0	*Surface of Pillar.*—This station is on a small mound, the site of the ruined village of Rabza, about a mile south of Pangontah, and more than half a mile to the east of Peengree village.
Rookhnawala T. S. Lat. 31° 8′ 27″. Long. 75° 5′ 3″. Ferozpoor District.	...	726·2	*Surface of Pillar.*—Is situated directly between the villages known as "Burra Rookhnawala" and "Chota Rookhnawala," about 200 yards from the former and 60 yards from the latter.

Gurhagarh Meridional Series, from Jammoo to Neemuch.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Hastiwala T. S. ... Lat. 31° 3′ 48″. Long. 74° 56′ 12″. Ferozpoor District.	...	713·0	*Surface of Pillar.*—About four-tenths or a mile to the south-west of the little village of Hastiwala, stands the tower denoting this site of observation.
Dulloowala T. S. ... Lat. 30° 59′ 6″. Long. 75° 5′ 51″. Ferozpoor District.	...	727·6	*Surface of Pillar.*—Is 0·332 of a mile due north of the small village of Dulloowala, 1·231 miles from the village of "Burra" Kamalpoor, and 1·215 miles from that of Kotora.
Sodiwala T. S. ... Lat. 30° 55′ 0″. Long. 74° 58′ 5″. Ferozpoor District.	...	718·4	*Surface of Pillar.*—Is situated 0·141 of a mile north-east of the large village of Sodiwala. Ratola is 1·216 and Bukeelanwala 1·678 miles from the station.
Daraoli T. S. ... Lat. 30° 48′ 36″. Long. 75° 5′ 14″. Ferozpoor District.	...	759·1	*Upper Markstone.*—This tower stands on the north-west bastion of a ruined fort within the large village of Daraoli.
Tamalawala T. S. ... Lat. 30° 44′ 44″. Long. 74° 55′ 37″. Ferozpoor District.	...	728·8	*Surface of Pillar.*—At a distance of about half a mile to the south-west of Gill village is situated the tower station of Tamalawala, named after the mound on which it stands.
Kunandwala T. S. ... Lat. 30° 39′ 37″. Long. 75° 4′ 22″. Ferozpoor District.	...	745·1	*Surface of Pillar.*—So called from the mound on which it is situated; is about a mile and a half south-east of the village of Roda.
Dhillon T. S. ... Lat. 30° 34′ 55″. Long. 74° 55′ 39″. Furreedkot Territory.	...	731·1	*Surface of Pillar.*—Is on a high mound about a mile and a half to the north-east of the village of the same name.
Lakarwala T. S. ... Lat. 30° 30′ 34″. Long. 75° 4′ 43″. Ferozpoor District.	...	736·4	*Surface of Pillar.*—This station is a mile and a half to the south of Sukhanand village, and has been named from the high mound on which it is situated.

Gurhagarh Meridional Series, from Jammoo to Neemuch.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Ulkwala T. S. ... Lat. 30° 27′ 26″. Long. 74° 55′ 55″. Nabheh Territory.	..	714·1	*Surface of Pillar.*—On a high mound of sand, about four-tenths of a mile north of Jeytoo village, lies the tower denoting this site of observation.
Khimouana T. S. ... Lat. 30° 22′ 14″. Long. 75° 3′ 10″. Furreedkot Territory.	...	731·4	*Upper Markstone.*—Is situated about three-tenths of a mile to the south of Khimounana village, on a high mound of sand.
Ahmadwala S. ... Lat. 30° 19′ 40″. Long. 74° 54′ 11″. Furreedkot Territory.	..	705·2	*Upper Markstone.*—About a mile and a half north-east of the village of Mimasurja, and on a high mound stands the station of Ahmadwala.
Muhna S. ... Lat. 30° 13′ 11″. Long. 75° 2′ 11″. Ferozpoor District.	...	730·3	*Upper Markstone.*—Is on a high mound about half a mile south of the village of the same name.
Thuna T. S. ... Lat. 30° 10′ 16″. Long. 74° 52′ 29″. Ferozpoor District.	...	703·6	*Surface of Pillar.*—So called from Thuna village, is on a low mound about 450 yards due east of the village.
Kyla Vandar T. S. ... Lat. 30° 3′ 48″. Long. 75° 2′ 37″. Puttiala Territory.	...	727·1	*Surface of Pillar.*—Is built on a high mound eight-tenths of a mile south-east of the village from which it derives its name.
Paka Sarawa T. S. ... Lat. 30° 1′ 51″. Long. 74° 53′ 48″. Puttiala Territory.	...	698·3	*Surface of Pillar.*—Will be found on the north-west solid bastion of an old Fort within the village of Paka Sarawa.
Garhwali T. S. ... Lat. 29° 55′ 53″. Long. 75° 1′ 43″. Puttiala Territory.	...	716·7	*Surface of Pillar.*—So named after the mound on which it stands; is about four-tenths of a mile north-east of the village of Phooloo Kharee.
Pipli T. S. ... Lat. 29° 52′ 5″. Long. 74° 54′ 51″. Sirsa District.	...	692·9	*Surface of Pillar.*—Is in the lands of Pipli, and about a mile and a quarter to the north-west of that village. Panyana village is eight-tenths of a mile west of the station.

Gurhagarh Meridional Series, from Jammoo to Neemuch.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Tiloka T. S. ... Lat. 29° 49′ 3″. Long. 75° 3′ 58″. Sirsa District.	...	709·8	*Surface of Pillar.*—Stands on a mound of sand about half a mile to the south-west of the village of the same name.
Gookhawali T. S. ... Lat. 29° 44′ 19″. Long. 74° 54′ 43″. Sirsa District.	...	687·4	*Surface of Pillar.*—Is situated on a mound a little more than a mile to the north-west of the village after which it has been named.
Sawaeepoor T. S. ... Lat. 29° 39′ 14″. Long. 75° 5′ 34″. Sirsa District.	...	697·3	*Surface of Pillar.*—This station is built on an old brick-kiln six hundred yards east of the little village of that name.
Choor Tibi S. ... Lat. 29° 35′ 31″. Long. 74° 54′ 24″. Sirsa District.	..	696·3	*Upper Markstone.*—Will be found on a sand hillock about a mile and a half south-east of Kharian village.
Sirsa S. ... Lat. 29° 31′ 35″. Long 75° 3′ 43″. Sirsa District.	...	737·6	*Upper Markstone.*—Adjoining the civil station of Sirsa on the western extremity of a very conspicuous mound, known as the "Ruins of Sirsa Garh," lies this site of observation.
Gidaranwala S. ... Lat. 29° 27′ 54″. Long. 74° 54′ 15″. Sirsa District.	..	679·2	*Upper Markstone.*—Is placed on a conspicuous mound (the remains of a village) 250 yards to the west of the small village of Gidaranwala.
Banka S. ... Lat. 29° 22′ 43″. Long. 75° 0′ 35″. Sirsa District.	...	710·1	*Upper Markstone.*—The platform marking this station is on a high sand hillock, about a mile and a half to the south-west of Gooria village.
Kala Thull S. ... Lat. 29° 18′ 57″. Long. 74° 53′ 34″. Beekaneer States.	...	692·9	*Upper Markstone.*—Is situated on a sand hill about three miles to the south of the village of Charemwasi.
Ramgarh S. ... Lat. 29° 13′ 4″. Long. 75° 1′ 40″. Beekaneer States.	...	694·2	*Upper Markstone.*—Stands on a sand hill about two miles and a half north-east of the village of the same name.

Gurhagarh Meridional Series, from Jammoo to Neemuch.

Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Khairwala S. ... Lat. 29° 8′ 28″. Long. 74° 52′ 34″. Beekaneer States.	...	740·0	*Upper Markstone.*—This platform is on a sand hill about three miles west of Burbeerana village, and five miles and a half south-east of the town of Nohur.
Se-aih S. ... Lat. 29° 1′ 3″. Long. 75° 3′ 58″. Beekaneer States.	..	759·7	*Upper Markstone.*—The sand hill on which this station stands is about a mile and a half to the south-east of Rasalana village.
Badalgarh S. ... Lat 28° 57′ 51″. Long. 74° 52′ 49″. Beekaneer States.	...	738·4	*Upper Markstone.*—Is situated on a sand hill about a mile to the north-west of Khopra village.
Rangarri S. ... Lat. 28° 53′ 26″. Long. 75° 1′ 32″. Beekaneer States.	...	777·4	*Upper Markstone.*—This hill-station lies a little more than a mile to the south-east of Rangarri, and less than a mile north-east of Chota Dherawas village.
Majha Chool S. ... Lat. 28° 47′ 8″. Long. 74° 54′ 37″. Beekaneer States.	...	843·3	*Upper Markstone.*—At a distance of more than two miles to the north of Raree village, is the sand hill on which this site of observation has been placed.
Makar Thull S. ... Lat. 28° 41′ 17″. Long. 75° 4′ 28″. Beekaneer States.	...	829·8	*Upper Markstone.*—Is built on a sand hill about a mile to the north of the town of Renee.
Narsirro S. ... Lat. 28° 34′ 34″. Long. 74° 54′ 24″. Beekaneer States.	...	868·2	*Upper Markstone.*—Situated on a sand hill about a mile and a half north-east of Kotwad, and four miles to the south-west of the large village of Buchawas is the station of Narsirro.
Ram Thull S. ... Lat. 28° 29′ 39″. Long. 75° 2′ 38″. Beekaneer States.	...	950·5	*Upper Markstone.*—The sand hill on which this site of observation stands is about half a mile east by south of Muthori village.
Khoslana S. ... Lat. 28° 24′ 48″. Long. 74° 55′ 8″. Beekaneer States.	...	973·5	*Upper Markstone.*—Is built on a sand hill about half a mile north by east of the village of Rerikla.

Gurhagarh Meridional Series, from Jammoo to Neemuch.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Randalia S. ... Lat. 28° 18′ 5″. Long. 75° 4′ 8″. Beekaneer States.	...	1,038·3	*Upper Markstone.*—About a mile and a half north-west of Balasir, about four miles north-west of the town of Busao, and about three miles east of the large town of Chooroo, lies the sand hill on which this station stands.
Moria S. ... Lat. 28° 13′ 7″. Long, 74° 54′ 51″. Beekaneer States.	...	1,080·3	*Upper Markstone.*—This hill-station is about two miles north-west of Majsir village.
Googla Bhar S. ... Lat. 28° 7′ 17″. Long. 75° 3′ 51″. Jeypoor States.	...	1,112·4	*Upper Markstone.*—Is built on a sand hill about a mile west of the little village of Laonda, and about four miles south-east of the large town of Ramgurh.
Beeramsir H. S. ... Lat. 28° 2′ 19″. Long. 74° 47′ 58″. Beekaneer States.	...	1,303·7	*Upper Markstone.*—Stands upon the ruins of a small fort, on an isolated hill, situated about half way between the villages of Beeramsir and Hurdeesir, Beeramsir village being about two miles north-east and Hurdeesir the same distance south-west of the station.
Garinda S. ... Lat. 27° 55′ 30″ Long. 75° 3′ 46″. Jeypoor States.	...	1,204·2	*Upper Markstone.*—Is situated on a sand hill less than a mile to the south-east of the village after which it is named.
Bhoomba S. ... Lat. 27° 46′ 42″. Long. 74° 58′ 53″. Jeypoor States.	...	1,261·2	*Upper Markstone.*—Will be found on a sand hill about a mile to the east of the villages of Bhoomba and Basni.
Guga H. S. ... Lat. 27° 40′ 49″. Long. 74° 37′ 59″. Jodhpoor States.	...	1,298·7	*Upper Markstone.*—Is placed on the highest point of an isolated range of hills lying about a mile south of the village of Lodsir.
Mira Doss S. ... Lat. 27° 35′ 59″. Long. 74° 56′ 11″. Jeypoor States.	...	1,317·2	*Upper Markstone.*—The sand hill on which this station stands is about eight miles east of the fort of Neechbo.

Gurhagarh Meridional Series, from Jammoo to Neemuch.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Teruthnath H. S. ... Lat. 27° 20′ 20″. Long. 74° 33′ 44″. Jodhpoor States.	...	1,477·9	*Upper Markstone.*—This station is on a hill near the village of Raesingpoora, the highest of an isolated range, about four miles to the south-west of the town of Deedwana. The station has been built a little lower down and to the east of the fakeer's house, which latter has the shape of a temple.
Panchwa* H. S. ... Lat. 27° 13′ 30″. Long. 74° 58′ 19″. Jodhpoor States.	...	2,048·1	*Upper Markstone.*—Stands on the highest point of the Panchwa range of hills, about half a mile north-west of the village of the same name. Panchwa Hill Fort is about 300 yards to the south of the station.
Kinsirra H. S. ... Lat. 26° 54′ 25″. Long. 74° 44′ 28″. Jodhpoor States.	...	2,423·3	*Upper Markstone.*—Is built on a pucka wall of a serai on the Kinsirra Hill. The station lies a mile to the south-west of the village of the same name.
Rewat H. S. ... Lat. 26° 53′ 54″. Long. 74° 19′ 21″. Jodhpoor States.	...	1,541·9	*Upper Markstone.*—On the highest point of an isolated hill near the village of Rewat is the station so called.
Goodha H. S. ... Lat. 26° 28′ 10″. Long. 74° 48′ 33″. Ajmere District.	...	2,417·8	*Upper Markstone.*—Is situated on the highest part of the hill to the east of that village, which is the nearest to it, and is about one mile distant. Nowolko is about a mile and a quarter north-east, and Sreenugger, the only village of any size in the neighbourhood, is three miles to the south.
Kisanpoora H. S. ... Lat. 26° 30′ 44″. Long. 74° 32′ 1″. Ajmere District.	...	2,562·6	*Upper Markstone.*—This station is placed on the range of hills which forms the north-west boundary of the Ajmere Province, separating it from the Jodhpoor States. The site of observation is about a mile and a half north-west of the village of Kisanpoora and a mile and a quarter south-east of the hill fort of Indergurh.

* Reciprocated observations, from Panchwa and Kinsirra, make the level of the Sambur salt lake to be 1,184 feet, at Goodah secondary station, (lat. 26° 57′ 8″, long. 75° 9′ 39″) on the brink of the lake.

Gurkagarh Meridional Series, from Jammoo to Neemuch.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Jetgarh H. S. Lat. 26° 18′ 6″. Long. 74° 21′ 4″. Ajmere District. ..	...	1,967·1	*Upper Markstone.*—Is on the hill half a mile west of a small and now ruined hill fort of the same name. A small rudely built temple lies about 40 yards south of the station, and a Revenue Survey platform is to the east, the mark in the latter being 15 feet 3·5 inches from the mark of the Great Trigonometrical Survey station.
Rajgarh H. S. Lat. 26° 17′ 49″. Long. 74° 38′ 12″. Ajmere District. ...	...	2,618·1	*Upper Markstone.*—Will be found on the peak at the head of the valley to the south-west of that fort, from which it is about a mile and a quarter distant. The hill is sometimes called Khora-ka-tonka, it is one mile south-east from the village of Kotaj, and on the boundary of the lands of that village and Rajgurh. The Revenue Survey station is on the hill, one and three-quarters of a mile north-east, and close north of Rajgurh Fort.
Boopki H. S. Lat. 26° 3′ 55″. Long. 74° 51′ 42″. Ajmere District. ...	...	1,877·9	*Upper Markstone.*—This station is built on the hill close north-east of the village after which it is named.
Ragpoora H. S. Lat. 26° 4′ 2″. Long. 74° 31′ 0″. Ajmere District. ...	...	1,932·0	*Upper Markstone.*—Is on the hill that lies half a mile east of the village from which the station derives its name, and one mile and a half west of Deomullee village. The Revenue Survey boundary pillar hill is one mile to the north.
Gokul H. S. Lat. 25° 44′ 21″. Long. 74° 29′ 39″. Oodepoor State. ...	...	1,539·0	*Upper Markstone.*—Is situated on a small isolated hill, three-quarters of a mile east of Amlesur, and a mile and a half south of Barasni. The station is named after a temple on the same hill, to the east of which the platform has been built, the mark being 50 feet 3 inches from the north-east corner, and 52 feet 10 inches from the south-east corner of the temple.

Gurhagarh Meridional Series, from Jammoo to Neemuch.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Height above Mean Sea Level. Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Daragarh H S. ... Lat. 25° 30′ 33″. Long. 74° 41′ 31″. Oodepoor State.	...	1,903·4	*Upper Markstone.*—Is called after the hill on which by tradition there once was a fort of that name, though no traces of any now exist. Katoonda village, in the lands of which the station lies, is three-quarters of a mile north-east, Bunnera fort and town about a mile and a half east, and Burrin village half a mile to the west.
Khamor H. S. ... Lat. 25° 45′ 15″. Long. 74° 49′ 56″. Oodepoor State.	...	1,393·4	*Upper Markstone.*—The station is placed on the same hill as the hill fort, and about 200 yards west of the principal house in Khamor village. The outer wall of the south tower of the fort is 230 feet to the east north-east of the station.
Kantola H. S. ... Lat. 25° 47′ 1″. Long. 75° 17′ 30″. Ajmere District.	...	1,909·1	*Upper Markstone.*—Is called after the name of the hill highest of those between Sawur and Gutiali, being about two miles north-east of the former place, and one and a half south-west of the latter. A hut, a few trees, and a ruined tank below the eastern side of the hill mark the site of an old village called Sewasagur.
Buglara H. S. ... Lat. 25° 30′ 45″. Long. 75° 26′ 28″. Boondi State.	...	1,308·1	*Upper Markstone.*—Is situated on the hill of the same name, which latter is about one mile to the west of the small village of Bejagurh, and two to the south of Thana, rather a large place.
Kadera S. ... Lat. 25° 48′ 16″. Long. 75° 4′ 22″. Ajmere District.	...	1,207·9	*Upper Markstone.*—This station is on a low sandy hillock, about one and a quarter miles west south-west, and within the boundary of Kadera town. The Ajmere and Kishangurh territory boundary runs about a quarter mile north of the station, the village of Alumbo, half mile north-west of the station, being in the Kishangurh State.

Gurhagarh Meridional Series, from Jammoo to Neemuch.

Names of Stations.	Height above Mean Sea Level. Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	Remarks and Descriptions of Stations.
Chichlana H. S. ... Lat. 25° 31′ 1″. Long. 74° 55′ 20″. Oodepoor State.	...	1,762·2	*Upper Markstone.*—Is placed on the highest part and towards the south-east end of that isolated and conspicuous hill which lies close to the south-east of, and has been named after, the small village of Chichlana. A masonry chuboutra, containing several objects to which sacrifice and worship are paid, and known by the name of "Bhyroo," is towards the middle of the hill, and about 150 yards north-west of the station platform.
Amulda H. S. ... Lat. 25° 28′ 59″. Long. 75° 11′ 16″. Oodepoor State.	...	1,612·2	*Upper Markstone.*—Will be found on the hill half a mile south of Amulda village. The small village of Ruttunpoor is under the eastern side of the hill, and Minoorpoor under the south-western.
Bisungarh H. S. ... Lat. 24° 59′ 13″. Long. 75° 26′ 43″.	...	1,933·4	*Upper Markstone.*—The station of Bisungarh is near the south-west corner of the terraced roof of the building within that hill fort, over the junction of two principal walls.
Lohara H. S. ... Lat. 24° 47′ 35″. Long. 75° 14′ 55″.	...	1,769·9	*Upper Markstone.*
Jabda H. S. ... Lat. 25° 12′ 0″. Long. 75° 19′ 40″. Oodepoor State.	...	1,815·1	*Upper Markstone.*—Is named after Jabda, a village about two miles to its south. The station is on a table hill covered with jungle, the small Bheel village called Tiki being one mile to the west. A deserted village, Manpoor, lies a mile and a half east, and Turode village two miles and a half south of the station.
Mandulgarh H. S. ... Lat. 25° 13′ 5″. Long. 75° 7′ 37″. Oodepoor State.	...	1,783·3	*Upper Markstone.*—Is situated about half a mile north-west of the walls of the fort from which it derives its name. There is a temple on the same hill, the Great Trigonometrical survey mark being 42·75 feet from the north-west and 46·50 feet from the south-west corner of the temple.

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Names of Stations.	Height above Mean Sea Level.		Remarks and Descriptions of Stations.
	Deduced by Spirit Leveling Operations.	Deduced Trigonometrically.	
Arnia H. S. ... Lat. 25° 1′ 55″. Long. 75° 13′ 55″.	...	2,008·3	*Upper Markstone.*—Is on the southern brow of the table-land which runs along parallel and to the north of the Bamni River. It is named after the village of Arnia, from which it is two miles north-east and about three miles north of Kawye.
Nal H. S. ... Lat. 25° 3′ 52″. Long. 74° 57′ 27″.	...	1,805·4	*Upper Markstone.*—This station is on the range of hills which form the western boundary of the valley in which the towns of Beygoo and Singoli are situated. The hills are covered with jungle and uninhabited. Nal, after which the station is called, lies about two miles and a half north-east, Dewrai the same distance east, Muloli three miles south-east, and Bhowta two miles south-west.
Mongodra H. S. ... Lat. 24° 54′ 48″. Long. 74° 44′ 45″. Oodepoor State.	...	2,001·4	*Upper Markstone.*—Is on the western edge of the range of table hills about half a mile south-west of Mongodra village. The fort of Chittore is on an isolated flat hill, detached from this table-land at a distance of about three miles west and quite overlooked by it.
Jat H. S. ... Lat. 24° 50′ 4″. Long. 75° 0′ 25″.	...	1,871·5	*Upper Markstone.*—Is placed towards the south end of the table-land, which is about two miles east of the town of the same name.
Malkhera H. S. ... Lat. 24° 34′ 26″. Long. 75° 8′ 33″. Holkar's Territory.	...	1,808·0	*Upper Markstone.*—Is situated on the table-land to the north of the small village of the same name. The station is about a mile and a half north-east of that village and the same distance north-west of Dantoli village. The hill fort of Dantoli is on a spur of the same table-land, about a mile and a quarter south-east.
Mendki H. S. ..	...	1,951·1	Vide page 172.
Arumlia H. S. ...	...	1,530·8	Vide page 173.